

# PC MAGAZINE

VOLUME 6 NUMBER 10  
MAY 26, 1987

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100

FREE LOTUS-STYLE MENU  
FOR ALL YOUR APPLICATIONS

## *Personal System/2: IBM's Bold New Line*

- *New Graphics*
- *New Bus*
- *New DOS*
- *New Size*



- Next-Generation Workstations:
  - Fast
  - Powerful
  - Secure
  - Connectable

- Special Report:  
How the Lotus Lawsuit Affects You
- 10 Ultra-High-Res Graphics Boards





NEW

# Turbo Basic

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## Introducing Turbo Basic, the high-speed BASIC you'd expect from Borland!

It's the BASIC compiler you've been waiting for. And it's so fast that you'll never have to wait again.

Turbo Basic is a complete development environment; it includes a lightning-fast compiler, an interactive editor, and a trace debugging system.

Because Turbo Basic is compatible with BASICA, chances are that you already know how to use Turbo Basic.

## With Turbo Basic your only speed is "Full Speed Ahead!"

You probably already know us for both Turbo Pascal<sup>®</sup> and Turbo Prolog.<sup>™</sup> Well, we've done it again!

We created Turbo Basic, because BASIC doesn't have to be slow.

In fact, building fast compilers is a Borland specialty; both our Turbo Pascal and our Turbo Prolog outperform all their rivals by factors, and with Turbo Basic, we're proud to introduce the first high-speed BASIC compiler for the IBM<sup>®</sup> PC. If BASIC taught you how to walk, Turbo Basic will teach you how to run!

### The Critics' Choice

"Borland has succeeded in stretching the language without weighing us down with unnecessary details... Turbo Basic is the answer to my wish for a simple yet blindingly fast recreational utility language... The one language you can't forget how to use, Turbo Basic is a computer language for the missus, the masters, the masses, and me."

Steve Gibson, InfoWorld

Borland's Turbo Basic has advantages over the Microsoft product, including support of the high-speed 8087 math chip.

John C. Dvorak

## Turbo Basic ends the basic confusion

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It's fast, BASICA-compatible, and because Turbo Basic is a Borland product, the price is right, the quality is there, and the power is at your fingertips. You see, Turbo Basic's part of the fast-growing Borland family of programming languages—we call it the "Turbo Family." Hundreds of thousands of users are already using Borland's languages, so you can't go wrong. So join a whole new generation of smart IBM PC users—get your copy of Turbo Basic today. You get an easy-to-read 300+ page manual, two disks, and a free MicroCalc spreadsheet—and an instant start in the fast new world of Turbo Basic. All of this for only \$99.95—Order your copy of Turbo Basic today!

### Free spreadsheet included, complete with source code!

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### A technical look at Turbo Basic

- ✓ Full recursion supported
- ✓ Standard IEEE floating-point format
- ✓ Floating-point support, with full 8087 (math co-processor) integration. Software emulation if no 8087 present
- ✓ Program size limited only by available memory (no 64K limitation)
- ✓ EGA and CGA support
- ✓ Access to local, static, and global variables
- ✓ Full integration of the compiler, editor, and executable program, with separate windows for editing, messages, tracing, and execution
- ✓ Compile, run-time, and I/O errors place you in the source code where error occurred
- ✓ New long integer (32-bit) data type
- ✓ Full 80-bit precision
- ✓ Pull-down menus
- ✓ Full window management

### System requirements

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Reflex: The Database Manager: IBM PC, AT, XT, or true compatibles. PC-DOS (MS-DOS) 2.0 and later. IBM CGA, Hercules Monochrome Card, or equivalent. IBM Reflex: The Workshop: Requires Reflex: The Database Manager. 384K.

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- Business Expense Tracking
- Petty Cash Tracking
- Line of Credit Tracking and Analysis
- Accounts Receivable Tracking and Aging Analysis
- Purchase Order Entry and Analysis
- Purchase Order Tracking System
- Leasing Inventory/Management
- Asset Inventory Tracking
- Cash Management Trial Balance
- Commercial Real Estate Tracking and Analysis

### For Administration:

- Mail Lists
- Appointment Scheduling
- Applicant Tracking and Inquiry System
- Facilities Planning
- Project Scheduling

### For Sales & Marketing:

- Sales Lead Tracking and Analysis
- Store Check Inventory Analysis
- Sales Analysis
- Trend Analysis

### For Production & Operations:

- Manufacturing Quality Assurance Tracking
- Assembly Repair Turnaround Tracking
- Product Cost Analysis and Control

44 Reflex does the job. Workshop shows you applications. The 400-page book that comes with Workshop has sections on creating accounting systems; inventory control; business expense reports; real estate management; production; operation and quality control; and just a whole bunch of other stuff.

Jerry Pournelle, BYTE 99

## Reflex: the critics' choice

... if you use a PC, you should know about Reflex. Reflex and Reflex Workshop may be the best bargain in software today.

Jerry Pournelle, BYTE

Everyone agrees that Reflex is the best-looking database they've ever seen.

Adam B. Green, InfoWorld

The next generation of software has officially arrived.

Peter Norton, PC Week 99

## Reflex: don't use your PC without it!

Join hundreds of thousands of enthusiastic Reflex users and experience the power and ease-of-use of Borland's award-winning Reflex.

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*Chris Veal, Partner, Regional Director of Micro Applications, Arthur Young.*

Accountants don't have much patience with time-wasting exercises. Which is perhaps why Arthur Young has embraced our word processor from the start. Microsoft® Word for the IBM® PC and compatibles and the Apple® Macintosh™

Because word processing is used at the management level, they required a command structure that was logical, clear, and uncomplicated. Because demanding secretaries use it, they demanded features in depth. Because they wanted everyone to use it, training had to be comprehensive, quick, and straightforward.

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what we wanted.  
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processors that met  
a very short list."

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**BURGEONING INDUSTRIES**  
**CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION**  
Years ended December 31, 1986 and 1985

Sources of funds:  
Working capital provided from operations:  
Net income  
Items not affecting working capital in the  
current period:  
Depreciation and amortization  
Current portion of deferred taxes

1986	1985
\$2,338,478	\$ 972,434
1,378,987	1,142,799
<u>70,112</u>	<u>200,813</u>
3,785,577	2,316,046
47,512	179,007
518,098	372,600
92,546	1,500,500
<u>52,374</u>	<u>776,890</u>
4,494,107	4,544
	5,149,587

148,623	
(213,675)	
<u>1,211,728</u>	
1,144,677	1,864,771
3,049,023	
<u>2,822</u>	
163,466	
315,791	

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PC Magazine: The Independent Guide to IBM Standard Personal Computers (ISSN 0893-2983) is published bi-monthly except in July and August for \$24.95 for one year (12 issues), \$36.95 for two years, and \$61.95 for three years. Additional postage \$4.00 per year for Canada and all other foreign countries. Ziff-Davis Publishing Co., a division of Ziff Communications Corp., One Park Avenue, New York, NY 10016. Second-class postage paid at New York, NY and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 5400, Boulder, CO 80521-4800. Editorial and Business Offices: One Park Avenue, New York, NY 10016. Telephone (212) 501-5215. Advertising (212) 501-5100. For subscription inquiries and service, write to PC Magazine, P.O. Box 2445, Boulder, CO 80521, (303) 447-9330. PC Magazine is an independent journal and affiliated in any way with International Business Machines Corporation. IBM is a registered trademark of International Business Machines Corp. Some contents Copyright © 1988 Ziff-Davis Publishing Co., a division of Ziff Communications Co. All rights reserved. Reproduction in whole or in part without permission is prohibited. The following are trademarks of Ziff Communications Co., PC. PC The Independent Guide to IBM Standard Personal Computers. PC Magazine. PC Mail. PC Laboratory. PC Lab. PC Labs. PC Communications. Project PC. PC Tapes. PC Blackboard. One-Click. Power User. Spreadsheet Clinic. The PC Utilities. PC Lab Notes. PC Advisor. First Look. Permissions: Material in this publication may be reproduced in any form without permission. Requests for permission should be directed to: Joe Levine, Ziff-Davis Publishing Company, One Park Avenue, New York, NY 10016. Editorial communications may be addressed to MCI 117-7000. Postmaster: Reader Service (212) 466-6100 (Please Call 4 N.Y.).





# GOODBYE, IBM...



## THANKS FOR THE MEMORIES

Have you ever noticed how time seems to change everything? Fashions change. Technology changes. Even the microcomputers we use change. Maybe that's why so many of our customers are saying goodbye to IBM in favor of a "good buy" from Wells American.

As time goes by, more and more computer users are realizing what an extraordinary value our A★Star II® truly is. It's the only AT class microcomputer that can run at 6, 8, 10 and 12 MHz! It's also the only PC/AT compatible that's "network ready." Better yet, each A★Star II now comes with your choice of keyboards - the original AT version or the enhanced "RT" style. Best of all, A★Star II prices start at only \$995!

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for RCA, one of the world's largest technical service organizations with 18,000 employees, to provide low cost, nationwide maintenance for our A★Star II. And if that's not enough, every unit includes free schematics and a no risk money-back guarantee.

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## COVER STORY

**Equipping Your Network:****The LANstation Alternative**

*Frank J. Derfler, Jr./The need for smaller, quieter, and less-costly machines for local area networks has spawned a new system appliance: the diskless workstation. The six LANstation systems reviewed are also excellent choices for improving network security*

## SPECIAL REPORT

• **Taking the Stand: The Look-and-Feel Issue Examined**

*Bill Machrone/Whatever its outcome, the Lotus lawsuits against 1-2-3 clone makers Mosaic Software and Paperback Software will have a tremendous impact on the kind of products you'll be able to buy. PC Magazine makes a powerful exception to its usual product review format to bring you in-depth coverage of the issues surrounding the cases that threaten to change the future of the entire personal computer industry*

• **The Copyright Law on Trial**

*Winn L. Rosch/Current cases, such as the Lotus lawsuits, could set precedents that would extend the copyright law's reach to protect a program's "look and feel"*

## FEATURES

• **Roots: The Evolution of Innovation**

*Bill Machrone/The computer industry has long depended on the refinement of previous products rather than on revolutionary breakthroughs to develop improved software packages. Here's a look at the genealogy of some of the industry's most important products*

• **Who Owns the Standards?**

*Jim Seymour/How are standards defined in the computer industry—and when do standards end and proprietary extensions of those standards begin?*

• **Who'll Think of Using What Next?**

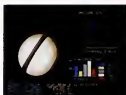
*Stephen Manes/Contributing editor Stephen Manes looks into his crystal ball to determine the outrageous lawsuits you can expect in the future if Lotus wins its cases*

• **You Be the Judge**

*Jared Taylor/PC Magazine presents you with the clear-cut facts you'll need to form your own opinion in the Lotus lawsuits and gives you a chance to be part of the jury by filling out our special editorial survey*

**WORD PROCESSING**  
**Major Word Processors Get Better**

*Merv Adrian/The latest enhancements to IBM's DisplayWrite 3, MultiMate Advantage, OfficeWriter, Microsoft Word, WordPerfect, WordStar, and XyWrite III bring greater flexibility to these longtime best-selling corporate and professional word processing programs*



## HARDWARE

**Four-Figure Video**

*Charles Petzold/In the current state of the art, four-figure video means boards and monitors with horizontal or vertical resolutions of over 1,000 pixels—plus price tags of at least \$1,000*

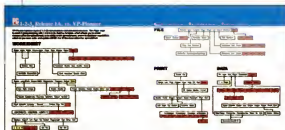
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**WATERHOUSE REPORT**  
**New Views: A New Paradigm for Accounting Software**

*G. William Dauphinais, Timothy J. Lee, and Michael J. Siconolfi/Q. W. Page Associates has come up with an unorthodox but flexible approach to accounting software*

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*Barbara Krasnoff/PC Magazine's reviewers look at 19 of the best books on personal computing*

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How closely does VP-Planner resemble 1-2-3? Page 190.





## FIRST LOOKS

### Hands On:

**The New IBM Products**  
The facts, the specs, and the benchmark test results for the new IBM Personal System/2. Hands-on reviews of the Model 30 and Model 50; technical details on the Model 60 and Model 80; perspective on the effect of the new bus and new VGA graphics standards on current systems; details on the new operating systems from IBM and Microsoft; details on other new IBM products; plus a hands-on review of the new, faster **Proprinter** ..... 33

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### Cover Photograph:

Thom O'Connor

# WHAT'S INSIDE



PC Magazine's editors inspecting IBM's Personal System/2.

IBM joked about the Personal System/2 being the worst-kept secret in Big Blue's history. But the five PCs rolled out April 2 still held a number of surprises—the 20-MHz speed of the top-of-the-line Model 80, the extensive use of tough-to-clone custom support chips, and all the I/O (video, serial,

parallel) that's been reduced from boards to chips and put on the motherboard, which IBM now calls a planar board. IBM also calls its \$1,695 to \$10,995 machines a relative price-performance bargain, but that remains to be seen.

To bring you hands-on First Looks of the new PCs, *PC Magazine* assembled a staff of more than a dozen editors to poke, prod, photograph, benchmark-test, and analyze the Personal System/2 units, drives, monitors, printers, and related offerings. The report fills nearly all of the late-closing First Looks section and continues *PC Magazine's* tradition of bringing you reviews and benchmark tests as quickly as other magazines bring you straight news.

While *PC Magazine* readers know us for our product reviews and productivity columns—not for our news analysis—when that rare story comes along that threatens to alter the future of the computer industry, we can't sit on the sidelines and say, "That's not our job."

The Lotus "look and feel" lawsuit that charges Paperback Software and Mosaic Software with infringing on the 1-2-3 copyright is such a story. At stake is your ability to buy software that has screens that look like other programs and that works like other programs. It's an issue that's riling product developers and end users alike. And it's anyone's guess what the results of the case might mean for manufacturers of PC clones. Copyright law has yet to catch up to changes in computer technology. Our special report, "Taking the Stand: The Look-and-Feel Issue Examined," beginning on page 154, is our effort to put some perspective on these issues and to give you the facts you need to form your own opinions.

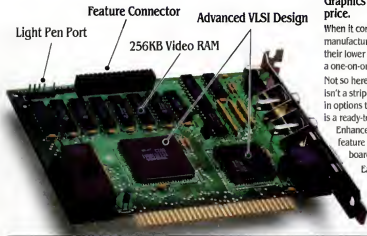
And since end users stand to lose the most from the outcome of this case, we'd like to hear what you think about it. You're invited to fill out our survey, inserted after page 188, and return it to us. We'll publish the results in a future issue.

The systems reviewed in our planned cover story (that's what the table of contents opposite proclaims, but then IBM grabbed the spotlight), "Equipping Your Network: The LANstation Alternative," on page 125, are designed specifically to give your network extra security. Since LANstations have no disk drives, you cannot copy either data or programs onto a floppy disk and remove them from the network. Additionally, they're small, quiet, and fast. So are the machines that finally made the cover.



# Compare.

## EGA by BOCA™



EGA by BOCA brings heavyweight Enhanced Graphics Adapter features at a lightweight price.

When it comes to product marketing, a lot of manufacturers who might be eager to point out their lower product cost aren't so eager to enter a one-on-one comparison of product features. Not so here at Boca Research. Our new EGA by BOCA isn't a stripped down board that'll cost you a fortune in options to make perform. For only \$199, EGA by BOCA is a ready-to-go, state-of-the-art, industry standard Enhanced Graphics Adapter that can stand up feature for feature with the most popular boards in town.

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Video-7 Inc. *VEGA	256KB	●	●	●	●	●	●	2 YRS	\$499
Paradise Systems, Inc. *AutoSwitch EGA	256KB	●	●	●	●	●	●	1 YR	\$599
Genoa Systems Corp. *Spectra EGA Model 4800	256KB	●	●	●	●	●	●	1 YR	\$449
ATronics International, Inc. *MegaGraph Plus	256KB†	●	●	●	●	●	●	1 YR	\$549
IBM Corp. *IBM EGA	256KB†	●	●	††	●	●	●	90 DAYS	\$982

† Requires two memory expansion options.

†† Compatible only to the BIOS level, but not the hardware level.  
Will not be compatible with most games software.

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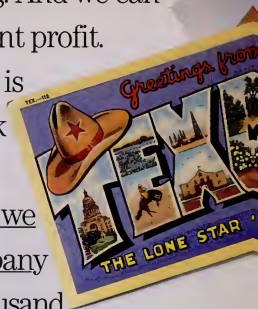
286 system for about half of what IBM





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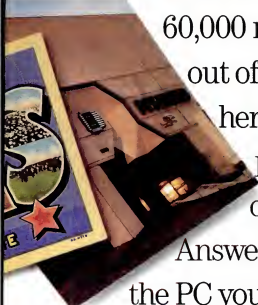
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AT-style Keyboard  
192 watt Power Supply  
Clock/Calendar with battery backup  
Hercules compatible Monochrome Graphics card  
2 Serial and 2 Parallel ports  
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192 watt Power Supply  
Clock/Calendar with battery backup  
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2 Serial and 2 Parallel ports  
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AT standard chassis



Space saving chassis



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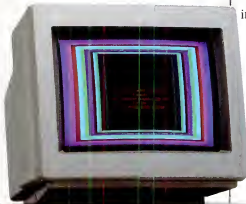
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PC Magazine, Jan 27, 1987

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# LETTERS TO PC MAGAZINE



## HERE COMES HAL

Thank you very much for the strong highlighting you gave to Lotus's HAL ("And Here Comes HAL," PC Magazine, Volume 6 Number 4). Although Charles Petzold said many positive things about HAL overall, we would like to point out some errors and omissions that he made.



HAL does indeed allow users to indicate linked cells.

The reason no formula or special symbols are placed in the cells is intentional—so that the worksheet will work perfectly for someone who does not have HAL. In addition, HAL does not use the file combine facility to do linking. One way to confirm this is to link to a formula cell in another worksheet. File Combine brings in the formula and evaluates it in the current worksheet, while HAL's linking evaluates the formula first in its own worksheet and then brings in only the value. You cannot perform this type of link with an autoexecute macro.

Also, HAL does provide help when you press F1 a second time, which is clearly indicated at the bottom of the screen.

Bill Gross

Lotus Development Corp.  
Cambridge, Massachusetts

Charles Petzold replies:

*The comments about the differences between HAL's file linking and 1-2-3's File Combine are true, and I recognize the reasons why HAL could not make changes to 1-2-3's formula formatting. My comments on this really constitute a belated negative*

*review of 1-2-3, Release 2. I would have liked to have seen formulas in Release 2 allow other .WKS names and ranges for file linking. That's the best approach, and I expected to see it in Release 2. It's a real kick in the shins when Lotus implies that 1-2-3 users can get this facility only from an add-on product.*

*Whenever I press F1 a second time in HAL's Help, I get a very brief string of symbols. That does not constitute "more Help" to me. HAL should tell me what it was expecting to find in the command line when it detected an error and beeped.*

In your February 24, 1987, issue's article on HAL ("And Here Comes HAL"), you made a very derogatory statement about secretaries using Lotus's 1-2-3. I have been using 1-2-3 for about 3 years now. Not only have I designed spreadsheets, but I have also set up a word processing macro that I use for all my letters and memos. I had no special training in 1-2-3—I just read the manual.

I think you owe secretaries an apology. I suppose you made the statement because you thought secretaries would not be reading your magazine. I may not anymore.

Ann Bringear

Richardson, Texas

I would like to take this opportunity to comment on Charles Petzold's article "And Here Comes HAL." Mr. Petzold appears rather impatient concerning the development of state-of-the-art technology such as plain language interfaces. Clearly, HAL is not the missing link between man and computer. However, state-of-the-art technology in any field, whether it's language interpreters, word processors, or barbecue grills, isn't reached on the first

try. HAL represents a step in the right direction toward English-speaking computers, and a large step at that. Lotus Development Corp. deserves to be congratulated on this monumental advancement in the computing field.

Paul K. Feldman

Wayne, New Jersey

## A CHEAP SHOT?

There is an old adage: those who can, do; those who can't, teach. In this case, I think it's more like: those who can't, become guest writers for national magazines so they can take cheap shots at people such as Steve Jobs (Stephen Manes, PC Magazine, Volume 6 Number 4).

Sure, you can sit there and be a "technocratic" snob and tell us that in your opinion micros are basically a joke with their metaphoric simulations of real problems and solutions. But to most of us micro users out here in the real world, your article reads like the rantings of a frustrated programmer stuck in his little niche in the corporate structure with no way out.

As for me, I say hooray for Steve Jobs. He had the foresight, guts, and the brilliance to help build a company that changed the evolution of small-computer data processing and altered our thinking of the computer as a tool to be used by all, and not just those elite few who have access to and knowledge of mainframes.

D.A. Corwin

Union, Maine

Stephen Manes replies:

*The only corporation that pays me a salary is the one I co-own. I haven't used a mainframe in over 20 years. I'm a regular writer in these pages, and my column in fact praised Jobs's approach toward simulation.*



# Boost cursor speed. Stop cursor run-on.

With all the recent hoopla over performance, it's ironic that two of the PC's ergonomic deficiencies have been overlooked — its slow cursor, and the tendency of the cursor to remain in motion (run-on) after a cursor key has been released. Finally, the solution — Cruise Control™ from Revolution Software.

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## ■ LETTERS

### A 386 DEBATE

In his letter to *PC Magazine* (*PC Magazine*, Volume 6 Number 4), George L. Trigg says he cannot believe that millions of personal computer users will ever need a 130-megabyte hard disk or the power of a 386 chip. Doesn't he know that one of the few sure things in personal computing is that today's state-of-the-art machine is all too soon tomorrow's boat anchor?

But perhaps I can interest him in my TRS-80 Model I. It's only 9 years old and has been upgraded several times from 4K bytes of RAM to 48K. Or maybe he wants to bid on my 2½-year-old PCjr. Who'll ever want to run a program at home that needs more than 128K?

So keep writing about the bigger-better-faster machines that come down the line. I have no idea what I'll use it for, but when it gets into my price range, I'll want it.

John W. Wilder  
Janesville, Wisconsin

I was shocked at the tone of your response to George L. Trigg's letter (Letters to *PC Magazine*). It seems to me that your magazine is obsessed with newer and more powerful technology without regard for ei-

Executive editor Bill Howard replies:

*Reader Trigg's letter smacked of the Moral Majority, Microchip Division: as a true personal computer user, he didn't have any use for a 386, by gum, and if he didn't, no one else would either.*

### OTC PRINTER RETESTED

We were unpleasantly surprised by your printer issue ("The Third Annual Survey: Printers," *PC Magazine*, Volume 5 Number 19), as the evaluation did not justify, define, or explain our printer's speed capabilities.

Eighty-column applications, such as letters or the PC Labs test you used, simply do not show full speed on our OT-700e, because only two of the three available side-by-side heads are printing. Our printer is optimized for wide-document, draft printing.

Our TriMatrix 700 Series printers are optimized for 136-character-wide document printing, such as spreadsheets and other data processing reports. It is for these applications that our printer outperforms all other serial dot matrix competitors. Our throughput is a minimum of 200 lines per minute, which translates to 453 characters per second for each 136-column document.

In addition, our printers are positioned at the low end of the line printer market, as opposed to the high end of the dot matrix market. Therefore, when referencing speed, it is best to also note our throughput speed of 200 lines per minute.

Marie L. Hartis  
Marketing Manager  
Output Technology Corp.  
Spokane, Washington

William G. Wong, PC Labs director, replies:

*PC Labs retested the OTC TriMatrix 700 Series printer using a wider document to take into account the number of printheads included with the printer. We found the claim of 200 lines per minute to be accurate and that the speed tends to be in this range regardless of the number of characters actually printed. This makes the print-*



## ■ One sure thing is that today's state-of-the-art machine is all too soon tomorrow's boat anchor.

ther the usefulness or affordability of this hardware. Is there any reason to pay for more power than you can use, other than to stay in the good graces of *PC Magazine*'s editors? Isn't it wise to spend that money on a better printer or display system rather than just cranking up the CPU?

Don't get me wrong—I'm all for more power, as long as it doesn't cost me any more. But I'm not going to take out a second mortgage to buy a Deskpro 386 just because *PC Magazine* thinks I'm a Luddite if I don't.

David J. Pajerek  
Penfield, New York



# "Dac-Easy Base Lives Up to Its Name, Sets New Low-Cost DBMS Standard."

PC Magazine  
March 10, 1987



## A Powerful Relational Database That's Easy To Learn, Versatile, Very Affordable, And Much More.

Dac-Easy Base is indeed both powerful and easy to use. It offers a multitude of unique features to help you organize, locate, and sort all kinds of alphabetic and numeric data. Dac-Easy Base continues the low price/high performance tradition of the Dac-Easy Series. With worldwide sales of over 300,000 systems, Dac-Easy has become the new leader in software designed for small businesses.

### Flexible Menu System

Dac-Easy Base is actually two systems in one. If you are a novice you will appreciate the special Beginner Menu which contains the most commonly used features for creating, editing, and printing files. The more experienced database user will find the Advanced Menu allows instant access to each and every one of the powerful routines. In both menus, you are only a keystroke away from the context-sensitive help screens. The help screens in Dac-Easy Base are so complete you may never have to consult the accompanying 200 page manual.

### Easy File And Report Creation

Design professional-looking data input screens without leaving the menu structure. There is no need for complex programming. Once created, the edit screen allows you to input and edit your information in a matter of minutes. Also attach special notes to any of your records with the built-in MemoWriter. The MemoWriter is the perfect way to attach specific information to a single record. Custom reports are easy to create without using the available

programming language. Column or page-style reports can be created quickly, and viewed on your computer screen or printed to paper. As with all reports generated by Dac-Easy Base, you can select which records will be included in your report and how they will be sorted. Special headings and subtotals can be added to give you the exact information you need.

### Great For Advanced Users

Yes, Dac-Easy Base is easy to use, and it is also very powerful. An unlimited number of records with up to 60 fields per record, ability to access up to three files at a time, date arithmetic capability, formula fields for calculations within files, dynamic abbreviations, and keyboard macros are just a few of the powerful features available at your fingertips. Dac-Easy Base can read and convert dBASE II files and can run dBASE II programs.

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PC Magazine  
March 10, 1987

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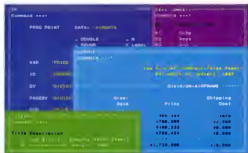




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## LETTERS

er ideal for applications that require wide printouts such as spreadsheets and accounting forms. However, the performance tends to be wasted if you intend to use it primarily for letters that would not take advantage of the three printheads.

## THE COPYRIGHT FIGHT

Hooray for Bill Machrone's "The Copyright Fight" (From the Editor's Screen, *PC Magazine*, Volume 6 Number 4). Since I've previously had little luck getting through to your Interactive Reader Service, I've had to rely on surreptitious

■ Your new copyright policy will help forge an objective legal structure for the cybernetics era.

copies of your programs from other BBS systems. *PC Magazine* has now become a good source of well-documented, shareable PC utilities. (And yes, we will be wary of your programs obtained from other sources; your fears of their alteration are not groundless.)

Chris Novak  
St. Louis, Missouri

Congratulations on your editorial "The Copyright Fight." You have discovered a market-oriented policy that is founded on the nature of software and data.

However, one point needs to be clarified. You claimed that copyright laws were intended to protect a person's ideas. In fact, copyright laws were invented by kings who sought to skim money from the (then new) printing industry. The "right to copy" belonged to the Crown and was granted to others. That is why the author's kickback to this day is called a royalty.

In any case, your new policy will help forge an objective legal structure for the cybernetics era.

Michael E. Marotta  
Lansing, Michigan

## CORRECTIONS/AMPLIFICATIONS

Intelpo's PEP printer-emulation package (First Looks, page 44, *PC Magazine*, Volume 6 Number 3) is not copy protected.

The Software Group is selling *Enable/LAN* in configurations of three or more workstation packages, with a base price of \$1,495 for three. Additional pricing information can be obtained by calling The Software Group at (518) 877-8600 (First Looks, page 59, *PC Magazine*, Volume 6 Number 3).

The subtitle accompanying the article "State of the Art's M\*A\*S\*90: Well Beyond the Accounting Basics" (*PC Magazine*, Volume 5 Number 20) does not reflect the opinions of the Price Waterhouse experts who evaluated the program.



The correct phone number for *NYWord* (From the Editor's Screen, *PC Magazine*, Volume 6 Number 5) is (718) 793-5670.

In "Laser Printer Technology: Sheet Feeders Multiply Your Printing Options" (*PC Magazine*, Volume 6 Number 8), the photograph on page 150 is of the JetFeed I and belongs in the sidebar on page 154. The sidebar photograph is the MF 850 Laser Feeder.

## HOW TO WRITE TO PC MAGAZINE

Do you have a comment, compliment, or criticism about something you've read in *PC Magazine*? A question you'd like to open up to other readers? Then send your opinion on paper or disk to Letters to *PC Magazine*, One Park Avenue, New York, NY 10016, or through MCI Mail to PCMAGAZINE at address 157-9301.

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dBc™ links C to dBASE. It creates and maintains files and then indexes which exactly replicate dBASE file design. So dBASE can read and update them. And the reverse: dBc can use any files created by dBASE. Now C and dBASE can operate on the same data with ease and speed. This opens up the widespread culture of dBASE installers to exploitation by C programmers. Tap that market, avoid the tedious dBASE language, and gain the advantages of C with the simple product. dBc's functions parallel all dBASE's file handling commands, many decomposed to give closer control. Each backed by demo source files on disk.

## WINDOWS for C/WINDOWS for DATA Microsoft's Windows™ and TopView™ Compatible

Windows for C™ is a library of over 80 functions to aid the power and productivity of window partitioning to your application. Unlimited windows, each defined as a C structure for easy reference throughout your program, can be made either to pop up or permanently overlay the screen. Routines will scroll and highlight lists with arrow keys, will read and scroll ASCII files vertically and horizontally in windows, and even write to memory-loaded files off the screen. Logical treatment of video attributes permits unchanged programs to run on color or monochrome. Colors of windows are set individually.

All functions are in separate modules, only those used are linked. Only buffers holding on-screen or temporarily discarded windows occupy RAM, others released dynamically. Best overall, rating and fastest display in Bill Hurt's 7/85 Tech Journal review of his windowing products.

Windows for C Data comprises all of the Windows for C for C and C++ compilers, the windows as well. At the high level a single function lets you specify prompt string, field length, data type, screen location, picture, target variable, then sets lesser functions scurrying to get and process a user's input. There are utilities to get system date and time, mess with strings, create your own masks for fields. Field output can require entry, prevent entry, permit scroll or overtype, beep on arrival or overflow keystrokes, and attachment of field-specific help messages.

And functions you want called to display messages or validate entries. And you decide which keys will clear a field, jump to the next or prior, quit, etc. Options dressage enough that a set of "heide" can be made to behave like a Lotus™ menu. Specify Compiler: PC Brand, T0100 Windows for C \$285 \$145, T0150 Windows for Data \$285 \$250.

## MICROSOFT C 4.0 A Great C Battle Rages and You're Winning

As the deadweights pound each other with ever heavier ordnance, today's programmers reap the spoils of this war. Bundling a source debugger and a "make," and sporting a "huge" memory model permitting single data objects larger than 64K, the Microsoft C compiler has jumped a full version number to 4.0. But what's really impressive are the benefits made possible by the new C (8-86) encyclopedia: survey of 17 C compilers. Microsoft's and IBM's C (increased from Microsoft) run away with the contest winning 11 of 27 benchmarks. The CodeView™ debugger, free for a limited time, uses windows to show everything on one screen, source alongside disassembled object, variables, stack and memory usage. It even uses a mouse if you like—obvious learning of commands. A source-level debugger that puts the rest to shame? (Debbis).

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Microsoft C now has five memory models for code and data, plus no-library support for another thousand, and boasts alternate math packages for speed versus accuracy, with or without 8087/8088 chips.

Both linker and library managers are part of the package, as is the "make," a UNIX™ name for a smart batch program which knows to expend minimum effort to rebuild any size of project by compiling and assembling only elements affected by new or changed modules.

It is reportedly used by Lotus, Ashton-Tate and, fittingly, Microsoft itself to develop Windows. Debbis calls it "the best MS-DOS C development environment value today (and usually any kind of program conceivable)." \$20K suggested.

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## C-TREE & R-TREE B-Tree File Manager Now Has Report Generator

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r-tree: thousands of c-tree users (and you now have a suddenly expanded ability to produce ad hoc reports from files maintained by c-tree (v 4.1E or later), side-stepping the elaborate C coding usually entailed.

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dBc III Plus...supports multi-user DBASE	750	595	
with source	1500	1185	
Divi single user DBMS by Ram	195	139	
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SCREEN DESIGN		LIST	US
Curves by Lattice, UNIX screen designer	125	99	
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Greenleaf Data Windows...New	225	169	
with source	395	287	
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On-Line Help from Opti Tech Data	149	105	
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THE HAMMER by DEC Systems	195	139	
Report Option by Softcraft, Btrieve files, Grep	245	220	
Xtrieve by Softcraft, Query Utility for Btrieve	245	220	
FORTRAN COMPILERS & UTILITIES		LIST	US
ACS Time Series by Alpha Computer Service	495	405	
Plus by Alpha Computer Service	75	69	
Microsoft FORTRAN Links with Microsoft C	450	281	
Microsoft FORTRAN for XENIX	695	548	
RMFORTRAN by Ryan McFarland	595	441	
Scientific Subroutine by Ryan McFarland	145	125	
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RMICOL by Ryan McFarland	145	125	
RMICOL, S&A NISI 85 COBOL	1250	941	
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with Diagrammer, see Diagrammer	145	125	
HighControl by MDS, 723 byte file	125	109	







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## PC ADVISOR



*Help in creating customized help screens, in transferring files between a Model 100 and a PC, in running BASIC on a Hercules clone, and in avoiding RF interference.*

**CUSTOMIZED HELP SCREENS**

I am interested in purchasing a program to set up my own help screens. The idea is to pop up a help screen from within an application.

Peter Carr  
Los Angeles, California

*If you're writing your own programs, consider HELP!!! (Goldata Computer Services, Bryn Mawr, Pa.; (215) 525-1036; \$149.95) or High Screen (Softway, San Francisco, Calif.; (415) 397-4666; \$129); they'll easily insert help screens into your application. Pop Screen (Bay Soft, Albany, Calif.; (415) 527-3300; \$39.95) can do the same, although only for assembler, C, and Pascal programmers.*

*For adding help screens to the applications you're now using, you have two choices: Flash-Up Windows (Software Bottling Co. of New York, Maspeth, N.Y.; (718) 458-3700; \$90) and Rescue (Polaris Software, Escondido, Calif.; (619) 743-7800; \$149). Both provide screen-painting editors that let you easily customize help windows that you can pop up and put away from within other programs. Flash-Up Windows has the advantage of letting you use the pop-up screens for data entry, but Rescue excels in the degree to which you can customize the help screen, offering the ability to import text files from a word processor when building your help screens.*

**MODEL 100 TRANSFERS**

I bought my Tandy Model 100 to use in the field for taking notes. I planned to down-

load my notes into my Compaq Deskpro 286 but have been stymied. When I connect with the Model 100 using the CTTY command from the DOS prompt, I've been receiving no more than 14 or 15 characters. How do I move these files?

Chris Jones  
Wilton, Connecticut

*The CTTY command merely turns your serial port into the console, without providing a route for the incoming files to be saved to disk. This setup can't work with the Tandy Model 100 because it's not DOS compatible; you can't give it any file-transfer commands.*

*You need a simple communications program. ProComm is my favorite (DataStorm Technologies, Columbia, Mo.; (314) 449-7012; \$50 or \$35 with the manual on the disk), but PC-Dial (ButtonWare, Bellevue, Wash.; (800) JBUTTON; \$59.95) and PC-Talk (Headlands Com-*

*munications Corp., Tiburon, Calif.; (415) 435-0770; \$35) will also do the job.*

*These programs are not just for over-the-phone communications; they make machine-to-machine connections far more manageable.*

**HERCULES CLONE SHORTCOMING**

I was told that the Hercules-compatible board that came with my PC would run graphics. In general, I've had no problems, but I can't get any of the BASIC graphic statements to work. Is there something wrong with the board?

John Phillips  
Denver, Colorado

*There's probably nothing wrong with the board you (and the dozens of other people who've written with this question) own. Because you bought a clone, you're missing HBASIC, a program that Hercules supplies with its graphics boards to translate some of Microsoft's BASICA graphics statements for the Hercules command set.*

*The only way I know of to run graphics in BASIC without Hercules's own HBASIC is by running True BASIC (True BASIC, Hanover, N.H.; (800) TR BASIC; \$149.90).*

*A few people have distributed shareware patches to do the job, but none of them are fully compatible.*

**TV SIGNAL INTERFERENCE**

Recently it became necessary to place my PC clone close to my television. I immediately began to get extremely poor reception on the TV whenever the PC is on. I

■ **The CTTY command** merely turns your serial port into the console, without providing a route for incoming files to be saved to disk.



## ■ PC ADVISOR

grounded the computer's case, but that made only minimal difference. Is there a relatively cheap, easy way to shield the RF? Also, should I be getting that much RF in the first place?

Steven Hartin  
Baltimore, Maryland

*It's not surprising that you are getting enough RF (radio frequency wave) emissions to interfere with a television signal. Although IBM builds noise filtering into its machines, not all computers are built with such care.*

*An effective ground consists of thick (about 8-gauge) braided copper wire attached to a pipe or some other large piece of grounded metal.*

*More important, however, is to replace all cables with fully shielded cables, available at any computer supply store or at Radio Shack; make sure both ends are screwed on. All cables and power cords*

*should be as short as possible. Make sure all screws and rear panels are attached to the case to keep emissions inside.*

*If the machines are sharing a common power outlet, the computer should be*

■ **The magnetic fields around CRTs interact with one another, causing squirming and distortion of both displays.**

*plugged into an RF-suppressing filtered outlet strip. Curtis Manufacturing (Peterborough, N.H.; (603) 924-3823) and PTI Industries (Santa Cruz, Calif.; (408) 429-*

*6881) both have a good selection of different-sized units.*

*Keep the power cords away from one another, and at oblique angles to one another.*

*If possible, the television should be using an outside antenna, with coaxial cable running all the way in. If you must use 300-ohm antenna cable, make sure it is twisted one or two turns every foot.*

*You absolutely must keep the monitor several feet away from the TV. The magnetic fields around CRTs interact with one another, causing squirming and distortion of both displays.*

*Older TVs are less resistant to interference. If the problem persists, borrow a newer TV from a friend for comparison.*

## ASK THE ADVISOR

Send your questions to the PC Advisor, PC Magazine, One Park Avenue, New York, NY 10016.

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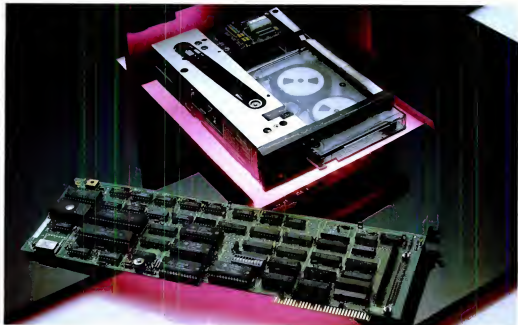
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# FIRST LOOKS

## IBM Builds New Plateau With Personal System/2

### PC ANALYSIS

BY BILL MACHRONE  
AND PAUL SOMERSON

After 2 years of lackluster product introductions and an eroding market share, IBM took a bold step in April to shore up its position as the PC industry leader.

The company announced a sleek new line of computers—dubbed the Personal System/2 to differentiate it from the older generation of PC hardware—and a wide assortment of advanced peripherals and software. Calling the products "a new generation," IBM officials rolled out:

- Three families of computers, featuring 3½-inch disks across the line and spanning the full range of Intel processors, with one chassis based on the 8086, two on the 80286, and one on the 80386.

- A new display standard built into two of the families, called Video Graphics Array (VGA), that offers higher resolutions and greater color selection than before.

- Four new analog monitors: an inexpensive black-and-white monochrome display, two smaller color displays, and one 16-inch high-resolution 1,024-by-768-dot display.

- Three enhanced families of printers, including two models of IBM's first 24-wire Proprinter, a speedier and whisper-quiet Quietwriter printer, and a capable Ricoh-based laser printer with an optional adapter offering PostScript drivers and

(continues on page 36)



The Personal System/2 ranges from an 8086-based Model 30 (left), to the 80286-equipped Model 80. A line of four new analog displays—interchangeable among models—achieves higher resolutions and greater color choices than before.

## OS/2: Multitasking DOS Slated for '88

### PC PREVIEW

BY CHARLES PETZOLD

It's not called DOS 5 or Protected Mode DOS or 286DOS or ADOS or CP-DOS.

It's called Operating System/2 (OS/2), and while it's not here yet, IBM plans a first quarter of 1988 release for the new operating system.

OS/2 is Microsoft's long-awaited multitasking operating system that exploits the "pro-

tection mode" of the 80286. Programs developed for OS/2 have access to 16 megabytes of real memory and 1 gigabyte of virtual memory.

These programs can be safely and efficiently multitasked, can create multiple threads of execution, and can engage in various types of interprocess and data sharing.

IBM's OS/2 will retail at \$325. The new operating system will run on all IBM PCs

(continues on page 38)

### SPECIAL REPORT:

#### IBM PS/2 MODEL 50

Hands-on review and benchmark results ..... 34

#### ANALOG DISPLAY STANDARDS

New colors, new modes... 43

#### IBM PS/2 MODEL 30

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# PS/2 Model 50: One-Stop Shopping For a Nearly State-of-the-Art 286 PC

## PC HANDS ON

BY CHARLES PETZOLD

The Personal System/2 Model 50 is the first computer to come with a built-in party game. The object of this game is to disassemble and reassemble the machine as quickly as possible. Screwdrivers are prohibited. Sound impossible? With a little practice, you might be able to clock in at under a minute.

This is no joke—the Model 50 has a modular construction that lends itself to the easy replacement of parts. The cover is connected by two thumbscrews at the back. Inside, the machine has no cables. The speaker slides out, the fan slides out, the floppy disk drive slides out, and the hard disk slides out. The only pieces bolted to the case are the power supply and the system board. Yet everything inside seems secure.

Remember how the screws that connect expansion boards to the chassis used to fall down to the system board? Those screws are gone. Thumbscrews on the outside of the case now hold down the expansion boards.

### Faster Than an AT

The PS/2 Model 50 is the lowest-cost 80286-based machine in the PS/2 line. The 80286 microprocessor in the Model 50 runs at 10 MHz with one wait state on memory accesses, so the machine's processing speed clocks in at about 25 percent faster than the 8-MHz PC AT. The system board includes a megabyte of memory, a parallel port, a serial port, a mouse port, and the Video Graphics Array (VGA) video adapter. The only extra hardware you need is one of the four new IBM monitors.

In one sense, the Model 50 is

the simplest machine in the Personal System/2 line because it is available in only one configuration: a 20-megabyte hard disk and one 1.44-megabyte 3½-inch floppy disk drive are standard. The Model 50 has room for a second internal 1.44-megabyte 3½-inch disk drive (\$245), but not for a second hard disk. Installation of a second floppy disk drive is ridiculously easy. The 20-megabyte hard disk is the only hard disk currently available for the Model 50, but if others become available in the future, hard disk replacement should also be a snap.

The hard disk is rated at 80-millisecond access time, and PC Labs tests show that to be accurate. This is comparable to the hard disks that are standard IBM issue in the PC-XT and the XT Model 286. To people who are accustomed to a PC AT (which has a hard disk with a 30-milli-

second access time), the Model 50 hard disk will seem a little slow.

In comparison with PCs and ATs, the Model 50 box is tiny and occupies a smaller footprint than even the Model 30. It has about the same depth (16½ inches) as an old PC or XT, but the 14-inch width makes it about 6 inches narrower than a PC or XT and 9 inches narrower than an AT.

### Uses New Bus

The Model 50 uses IBM's new Micro Channel Architecture (MCA) bus for expansion boards. One slot is dedicated for the hard disk controller and



## Benchmark Tests: IBM Personal System/2 Model 50 vs. 8-MHz IBM PC AT

The 10-MHz IBM Personal System/2 Model 50 tested out at 20 percent faster than the 8-MHz PC AT across the board, except in two areas: floating-point calculations, where it is 40 percent faster, and in hard disk seeks, where the Model 50's disk takes more than twice as long as the hard disk delivered with the IBM PC AT.

### Performance Times

(Times given in seconds except where noted)

	NOP	80286 Instruction Mix	Conventional Memory	Floating-Point Calculation (with 80287)	BIOS Disk Seek (milliseconds)
8-MHz IBM PC AT	4.17	0.96	1.32	3.10	37.19
IBM PS/2 Model 50	3.36	7.14	1.00	1.86	80.52

The NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("no operation") machine code instruction in a big 128K loop.

The 80286 Instruction Mix benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 80286 instruction code. These instructions are a subset of the total processor instruction set.

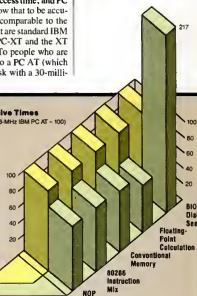
The Conventional Memory benchmark test allocates 256K bytes of conventional memory and treats it as a series of 64K-byte records, then 16,384 random records are read into and written from this memory. The result shown is the average of the read and write times.

The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.

The BIOS Disk Seek benchmark test measures the time it takes to do a random seek using the disk 2 ROM BIOS. The test result includes minimal software overhead and may not parallel the manufacturer's claimed average access time. The test program performs 1,000 seeks. The average result is shown in milliseconds.

### Relative Times

(Rate: 8-MHz IBM PC AT = 100)





PC  
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## PS/2 Model 50 System Board

Micro controller architecture bus

Video extension

Custom VLSI

80286

80287 Floppy disk connector

1 megabyte memory

three are free. (The machine doesn't need a floppy disk controller because it's built into the system board.) After OS/2 comes out some time next year, you will probably want to use one or two of the free slots to expand memory beyond the 1

megabyte on the system board.

I tested the Model 50 with IBM's 8513 12-inch color display. To my mind and eyes, a 12-inch display borders on the unacceptable, but it's definitely usable and it doesn't swamp the system unit with its size. The

VGA graphics adapter built into the Model 50 is EGA compatible but uses a larger 8- by 16-character box in text modes. The VGA is also capable of graphics modes of 640 by 480 pixels with 16 colors and 320 by 200 with 256 colors. (See

PC  
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FILEPersonal System/2 Model 50  
IBM Corp.

Contact your local authorized IBM dealer.

List Price: \$3,595

**Requires:** One of IBM's four Personal System/2 Monitors (either the 8503, 8512, 8513, or 8514), DOS 3.3.

**In Short:** The Model 50 is a small but powerful 80286-based machine with everything except a monitor built into the box (including a 640 by 480 graphics adapter). The only real drawbacks are an unimpressive 20-megabyte hard disk and limited expansion capabilities.

CIRCLE 421 ON READER SERVICE CARD

## "IBM Goes Analog." First Looks, page 43.)

What does the Model 50 give you over the Model 30? The Model 50 is faster because it uses an 80286 rather than an 8086. The Model 50 has EGA-compatible graphics while the Model 30 does not. In the future, the Model 50 will be able to run the new OS/2 operating system while the Model 30 will not. On the other hand, the Model 30 can use existing expansion boards while the Model 50 requires boards based on the new MCA bus, and there are very few of those right now.

What do you lose by not making the step up to the Model 60? The floor-standing Model 60 also runs a 10-MHz 80286, but it comes with a 44-megabyte or 70-megabyte hard disk (rated at 30-millisecond access time rather than 80) and can also take a second hard disk. The Model 60 has seven free expansion slots rather than the three in the Model 50.

I suspect the Model 50 will be a popular item in the Personal System/2 line for PC users who do not have large mass-storage requirements or a need to add expansion boards. The small box and simple internal construction make an appealing combination; the lack of options makes it an easy buy.



## Personal System/2

(continued from page 33)

more fonts than the Apple LaserWriter.

- Two new operating systems: Operating System/2 (OS/2), which will offer true multitasking, available early next year for 80286 and 80386 machines; and a beefed-up version of the existing DOS 3.x.

- A removable-media optical WORM (write once, read many) disk drive capable of storing 200 megabytes of data.

- A host of other products, including new LAN and 3270 emulators and software; a tape drive adapter; hard disks of varying sizes up to 115 megabytes; a 336-voice MIDI "music feature" and a new speech reproduction board; a two-button mouse; and assorted products that increase memory size, facilitate data transfer, and upgrade standard IBM applications software.

As important as what IBM announced is what it didn't announce. For the last 6 months, nervous competitors had speculated that IBM was going to reverse direction and shut down its open architecture. Word was that ROMs would be serialized, or "fingerprinted," to ensure that the new operating system wouldn't work on non-IBM hardware, and that the entire motherboard would be reduced to a handful of chips impossible to duplicate and so inexpensive

to produce that clone makers wouldn't have a chance.

While IBM did indeed reduce the chip count, wrap everything around five new custom VLSI gate arrays, and run all but the low-end Model 30 off a new state-of-the-art bus design called Micro Channel Architecture (MCA), IBM representatives went to great pains to emphasize that the PS/2 line would remain wide open to third-party manufacturers. And despite price cuts in the existing line, clone makers breathed easier when they learned that the lowest-priced system would retail for around \$2,000.

Still, in contrast to the PC's 100 percent reliance on off-the-shelf parts, the new machines contain as little as 20 percent shelf components. This, coupled with potential patent or copyright infringement on the MCA bus, will make these machines far more difficult to clone than the PC and AT.

The most modest PS/2 machine is IBM's 8086-based Model 30, running at 8 MHz with zero wait states. It has three old-style PC-compatible expansion slots and comes with either two 3½-inch 720K-byte floppy disks or one floppy disk and a slow (80-millisecond) 20-megabyte hard disk. The on-board graphics chip emulates the old CGA while offering 320 by 200 pixels with 256 colors out of a palette of 256,000, as well as 640 by 480 two-color

graphics. The Model 30 comes with 640K bytes of RAM; all other machines in the series boast a full megabyte (except for the top Model 80 version, which offers 2 megabytes).

As with all the machines in the PS/2 series, the I/O ports are on the system board and include serial, bidirectional parallel, a pointing device, and video. The math coprocessor in each runs at the same clock speed as the main CPU. And for the first time IBM is selling a two-button mouse, for \$95.

The 80286-based Model 50 runs at 10 MHz and is built around the new Micro Channel Architecture. It's about half the size of a PC AT and takes either two 1.44-megabyte floppy disks or one floppy disk and the same stately 20-megabyte hard disk as the Model 30.

IBM's Model 50 is the lowest-priced machine with the new VGA graphics. While it emulates today's 640 by 350 by 16-color EGA graphics, it also offers 16 colors from a palette of 256,000 in 640 by 480 pixels or 256 colors in 320 by 200 pixels. If you want even more resolution, you can opt for the 8514/A adapter, which boosts resolution to 1,024 by 768, deep into CAD/CAM and engineering workstation territory.

At the top of the 80286 heap are two versions of the Model 60, a floor-standing machine with seven expansion slots and room for larger, faster hard

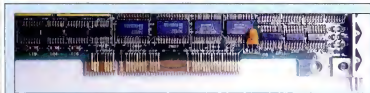
disks. It runs at the same speed as the Model 50, but the speedier disks increase overall throughput. There's also more room for expansion memory, up to 15 megabytes.

The flagship 80386-based Model 80 is also a floor-standing unit and comes standard with 1 or 2 megabytes of 80-nanosecond RAM, four 16-bit slots and three 32-bit slots, and one of three hard disks. Two 16-MHz versions (1 megabyte of RAM and a 40-megabyte drive or 2 megabytes and a 70-megabyte drive) will be available in July, and a pricey (\$11,000) 20-MHz screamer with 2 megabytes of RAM and a 115-megabyte hard disk is scheduled to shake up the industry in the fourth quarter of this year.

All models come with the new 101-key keyboard, built-in clock/calendar, and three-level security devices, and they show that IBM has been listening to its customers. Configuration is done by polling the hardware; there isn't a single DIP switch anywhere. The PC's rat's nest of cables has been replaced by sturdy upright printed circuit boards. All switches (including the big red one) and indicator lights are on the front panel. Covers and cables are held together with thumbscrews rather than slotted hex nuts, and cables have all been lengthened.

The Guide to Operations is a slender pamphlet rather than a thick binder. Construction is modular; one IBM representative disassembled and then reassembled an entire unit in well under a minute. Since better construction means fewer mechanical headaches, maintenance contracts have been slashed to a third of their previous cost.

The Personal System/2 has its work cut out for it. These machines must satisfy users' cravings for more speed, regain IBM's dominant market share, offer connectivity solutions for IBM's mainframe customers and the growing league of local area networkers, remain compatible with existing software, and be a platform for future growth. It's a tall order, but if the initial entries are any indication, IBM is well on the way. □



Above, edge connectors for the Model 50 and 60 expansion boards; below, a Model 80 32-bit connector. The 16-bit micro channel uses 77 signal lines, 24 power and ground lines, a separate audio ground line, and 5 reserved lines. Grounds are heavily dispersed throughout the bus to achieve reliability and a quiet RF level.





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## OS/2

(continued from page 33)

built around the Intel 80286 or 80386.

When running on the PS/2 machines, OS/2 can take advantage of ROM BIOS code built into the new machines to enable protected mode to run in less memory space. On the AT and XT Model 286, OS/2 must duplicate all BIOS functions in RAM-based drivers.

As is currently the case with MS-DOS, Microsoft will also license OS/2 to be sold by other PC vendors for their own 80286 and 80386-based machines, but Microsoft will not sell OS/2 directly to end users. The IBM version of OS/2 will most likely run on many AT compatibles. However, because OS/2 must access the machine's hardware directly, it probably will not run on all of them. It will be the responsibility of the computer maker to ensure compatibility.

Under OS/2 Version 1.0, a session is divided into one or



Windows, Version 2.0, will allow overlapping windows. Most programs (such as the PC Labs Windows benchmark test program) run fine under Windows 2.0.

more "screen groups." A user switches between screen groups via a "Session Manager" menu. All but one of the screen groups run in protected mode. The protected-mode screen groups have a user interface that's virtually the same as today's DOS interface but has some new commands and en-

hanced batch file operation.

Within each protected-mode screen group, one or more programs specially written for OS/2 can run simultaneously. Most often, only one program that actually uses the display will be running in each screen group. A user can run some programs "in the background."

## And the Winner Is... Windows

Out of the Windows Wars of 1985 a winner has emerged. IBM has chosen Microsoft Windows to play an important role in IBM's plans for the future. IBM has not merely accepted Windows—it's embraced it.

Windows will be an integral part of Operating System/2 in the form of the Presentation Manager. But because OS/2 is also part of IBM's ambitious System Application Architecture (SAA), the presence of Windows in OS/2 has profound implications.

SAA is an attempt by IBM to eliminate critical weaknesses in IBM's entire line of computers by standardizing communications protocols, applications program interfaces, screen displays, and user interfaces. For systems capable of graphics, the Windows display design, keyboard interface, and the use of menus and dialog boxes will be-

come an IBM standard.

This means that the Windows user interface is likely to also become familiar to users of IBM's minicomputers and mainframes. It also means that programmers may someday be able to write a single graphics-based Windows program that can be recompiled to run on a variety of IBM computers beyond the PS/2 models.

Working with IBM, Microsoft has made some changes to Windows to accommodate this objective. First, the user interface of the OS/2 Windows Presentation Manager will be somewhat different from current Windows. The windows will be overlapping (rather than tiled), and the use of the keyboard and menus will be changed slightly. Second, the entire Graphics Device Interface (GDI) of Windows will be replaced with IBM's GDDM, its graphics system for mainframe computers.

Current programs that run under Windows will have to be modified somewhat and recompiled to run under the OS/2 Windows Presentation Manager. Programs that make heavy use of graphics will require the most changes.

Users can get a preview of the Windows Presentation Manager when Microsoft releases Windows, Version 2.0 (scheduled for 3rd quarter 1987). Windows 2.0 runs under existing DOS versions and incorporates the changes being made to the interface for the OS/2 Windows Presentation Manager. Virtually all existing Windows-compatible programs will run under Windows 2.0.

For more-immediate needs, a new Microsoft Windows, Version 1.04, will be essentially the same as Windows 1.03 but will include drivers to use the new video modes and printers introduced with the IBM PS/2 machines.

—Charles Petzold

One screen group is reserved for a "DOS compatibility box" that does not run in protected mode. This provides an environment that can run most existing DOS programs. OS/2 uses the same file system as current versions of DOS so that protected-mode programs and current programs can use the same files.

OS/2 always multitasks all programs running in all protected-mode screen groups. However, OS/2 must suspend operation of the DOS-compatibility screen group when a protected-mode screen group is visible. Because current DOS programs cannot run in protected mode, the DOS compatibility box is isolated from the protected-mode groups. For instance, a DOS TSR program cannot be used while a protected-mode screen group is visible.

That's OS/2, Version 1.0. At some future time, IBM will release OS/2, Version 1.1. Under OS/2 1.1, one of the protected-mode screen groups will be a graphics-based windowing system. IBM calls this the Presentation Manager, and Microsoft calls it the Windows Presentation Manager. It's essentially a protected-mode version of Microsoft Windows.

Under OS/2 1.1, programmers will have a choice of developing applications for the Windows Presentation Manager environment or for a non-windowing environment. This choice will probably be based on the use of the display by the program. Character-mode applications can take advantage of OS/2's rich set of character-mode video output routines. Applications that use graphics can be written for the Presentation Manager and take advantage of the built-in graphics and dialog box logic.

Although OS/2 will run on machines using the 80386 microprocessor, OS/2 will not yet support the 80386's 32-bit linear addressing space. However, Microsoft intends to carry the OS/2 applications program interface into the 80386 upgrade. For both program developers and users, the transition to the 80386 operating system will be much simpler than the current step up from DOS to OS/2. □



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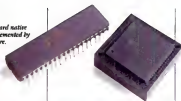
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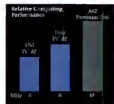
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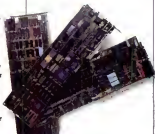
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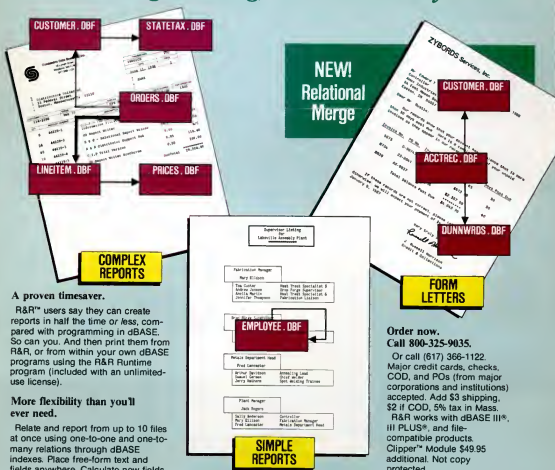
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# IBM Goes Analog: New Video Standards Show off Color

**PC HANDS ON**

BY CHARLES PETZOLD

IBM product announcements aren't normally accompanied by oohing and aahing from the audience, but the new color graphics of the Personal System/2 machines are surprisingly spectacular, indicating a recognition by IBM of the importance of graphics in the future of computer software.

All the new PS/2 machines have a video adapter built onto the system board. These video adapters have a graphics resolution of 640 by 480 pixels and text-mode character boxes of 8 by 16 or 9 by 16.

The big change is that IBM has gone analog. The new video adapters and monitors use analog signals and can generate 64 values for each of the red, green, and blue primaries. The result? A total of 262,144 colors, of which 256 can be displayed simultaneously.

The low-end Model 30 contains a built-in Multicolor Graphics Array (MCGA) video adapter. The MCGA emulates the two graphics modes of the IBM CGA (320 by 200 with 4 colors and 640 by 200 with 2 colors) and adds two new graphics modes: 640 by 480 with 2 colors and 320 by 200 with 256 colors. In text mode, the MCGA uses 16 colors and an 8-by-16-character box.

The Models 50, 60, and 80 contain a Video Graphics Array (VGA) video adapter on the system board. The VGA emulates the EGA, duplicates the graphics modes of the MCGA, and adds a 640 by 480 16-color graphics mode. In text mode, the VGA uses a 9 by 16 box.

An owner of a Model 30 (or an existing PC, PC-XT, or PC AT) will be able to add VGA graphics with the PS/2 Display Adapter; IBM expects the board to ship in July and to carry a list price of \$595.

IBM has left open an annoy-

ing gap in these new graphics standards. The only video mode that can display 256 simultaneous colors on the MCGA and VGA boards has a resolution of 320 by 200 pixels, not wide enough for the 80-column text required by some graphics programs.

The PS/2 MCGA and VGA video adapters have proprietary 15-pin connectors that require one of IBM's four new analog monitors. You can connect any of the new monitors to either the MCGA or VGA adapter.

Overall, the new monitors are somewhat unsatisfactory.

The 14-inch 8512 color monitor has a good price (\$595) but uses a .41mm stripe format that makes the image a little grainy.

The 12-inch 8513 color monitor is sharper (.28mm dot pitch) but with a smaller viewing area. The 12-inch 8503 monochrome display is reasonably priced (\$250), but you lose color (the display uses 64 shades of gray). The 16-inch 8514 has color and size, but it costs \$1,550.

While you can attach the 16-inch 8514 monitor to the MCGA or VGA adapter, this monitor is really designed for the new PS/2 8514/A Display

Adapter board. This \$1,290 board is scheduled for June shipment. The 8514/A uses the new bus connector and thus can be installed only in a PS/2 Model 50, 60, or 80. It allows all VGA video modes and adds a 1,024 by 768 16-color graphics mode. With the 8514 Memory Expansion Kit, the board can display 256 simultaneous colors in 640 by 480 and 1,024 by 768 graphics resolutions.

In conclusion, at the low-cost end you can run 640 by 480 graphics on PS/2 models by connecting the \$250 8503 monochrome monitor or the \$595 8512 color monitor. At the high end, you'll be able to match an 8514/A board, an 8514 monitor, and an 8514 memory expansion kit to achieve 1,024 by 768 resolution at a cost of \$3,110.

## Character Modes

Mode	Rows	Cols	Board	Char. Box	Resolution	Colors
0, 1	25	40	CGA	8 by 8	320 x 200	16
			EGA	8 by 14	320 x 350	16 out of 64
			MCGA	8 by 16	320 x 400	16 out of 262,144
			VGA	9 by 16	360 x 480	16 out of 262,144
2, 3	25	80	CGA	8 by 8	640 x 200	16
			EGA	8 by 14	640 x 350	16 out of 64
			MCGA	8 by 16	640 x 400	16 out of 262,144
			VGA	9 by 16	720 x 400	16 out of 262,144
7	25	80	MCGA	9 by 14	720 x 350	Monochrome
			EGA	9 by 14	720 x 350	Monochrome
			VGA	9 by 16	720 x 400	Monochrome

## Graphics Modes

Mode	Resolution	Board	Colors
4, 5	320 x 200	CGA	4 (two palettes)
		EGA	4 out of 64
		MCGA	4 out of 262,144
		VGA	4 out of 262,144
6	640 x 200	CGA	2 (foreground selectable)
		EGA	2 out of 64
		MCGA	2 out of 262,144
		VGA	2 out of 262,144
13	320 x 200	EGA	16 out of 64
		VGA	16 out of 262,144
14	640 x 200	EGA	16 out of 64
		VGA	16 out of 262,144
15	640 x 350	EGA	Monochrome
		VGA	Monochrome
16	640 x 350	EGA	16 out of 64
		VGA	16 out of 262,144
17	640 x 480	MCGA	2 out of 262,144
		VGA	2 out of 262,144
18	640 x 480	VGA	16 out of 262,144
19	320 x 200	MCGA	256 out of 262,144
		VGA	256 out of 262,144



# IBM's Bargain Model 30: The New PC with the Old Bus, MCGA Video

## PC HANDS ON

BY GUS VENDITTO

Pity the poor Model 30. Saddled from birth with an identity crisis, this PC will long be forcing its owner to answer the question, "The Model 30...is that one of those new PCs with a different bus?"

The Personal System/2 Model 30 does not have the new Micro Channel Architecture bus that distinguishes the Models 50, 60, and 80. This junior child in the PS/2 family is distinguished more by its use of an 8086-2 microprocessor (the first time this 9-year-old Intel chip is at the heart of an IBM personal computer) and by a performance that is, if not equal to, within shouting distance of IBM's own 8086 PC AT for most operations—and at half the price. The Model 30 also will not have the ability to run

IBM's multitasking OS/2, due early next year.

The Model 30 runs at 8 MHz with zero wait states, using a 16-bit data bus for ROM and read/write memory, and 8-bit transfers in I/O and DMA operations. There are 128K bytes of 125-nanosecond RAM socketed to the motherboard; the remainder of the 640K base memory sits in two banks of IBM's new 9-bit SIP (single-inline package) RAM.

The Personal System/2 Model 30 is for people who want to get their feet wet in the latest technology but are not ready to take the plunge of buying new boards to outfit their systems.

Of course, by building most of the functions you need into the system board, IBM is betting you won't have to move those add-in cards anyway. Like a Toyota, most of what you want is standard. And it better

be: there are only three side-mounted add-in slots for XT-compatible boards.

Parallel, serial, and mouse ports, real-time clock, floppy disk controller, display controller, and connector for the hard disk are all built into the system board using custom VLSI gate arrays. There are no jumpers or switches to set; all configurations are done through software.

There are two models: a \$1,695 two-floppy-disk version and a \$2,295 one-floppy-disk, one-hard-disk machine. All floppy disk drives are 3½-inch, 720K-byte. The slow hard disk (rated by IBM at 80 milliseconds, tested by PC Labs at 83) is the Model 30's Achilles' heel. It makes sense to buy the \$1,695 version and wait for the inevitable introduction of a faster external hard disk by a third party. Because the Model 30's hard disk has a built-in controller, you won't waste an expansion

slot if you do. Unlike the Model 50, some cabling is required for disk-to-system-board connections.

Although not explicitly supported by IBM, there is enough room behind the floppy disk drive to add a third drive, once a third-party developer comes up with a design.

The Model 30 will appeal to the budget-conscious. It doesn't equal the value offered by low-cost AT clones in absolute dollars and cents, but at a basement price it gives you IBM's rock-solid construction standards (evident everywhere in this machine from the solid keyboard feel to the tight fit of the add-in rack mount). And it lets you buy into a piece of IBM's new analog graphics standard at the ground floor.

You'll need any of the four new analog monitors; it doesn't matter which you choose—the 12-inch monochrome Model



## Benchmark Tests: IBM Personal System/2 Model 30 vs. IBM PC-XT

Running on Intel 8086 at 8 MHz, the IBM Personal System/2 Model 30 delivers the kind of performance gain over the 4.77-MHz PC-XT that you'd expect from those specs. There were no compatibility problems with any of the benchmark test programs.

### Performance Times

(Times given in seconds except where noted)

	NOP	8086 Instruction Mix	Conventional Memory	Floating-Point Calculation (with 8087)	BIOS Disk Seek (milliseconds)
IBM PC-XT	10.1	32.0	5.9	4.8	95.0
IBM PS/2 Model 30	4.2	18.5	3.2	2.4	82.4

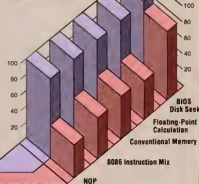
The **NOP** benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP (No Operation) machine code instruction in a big 128K loop.

The **8086 Instruction Mix** benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 8086 instruction code. These instructions are a subset of the total processor instruction set.

The **Conventional Memory** benchmark test allocates 256K bytes of conventional memory and treats it as a series of 64K-byte records; then 16,384 random records are read into and written from this memory. The result shown is the average of the read and write times.

The **Floating-Point Calculation** benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.

Relative Times  
(Ratio IBM PC-XT = 100)

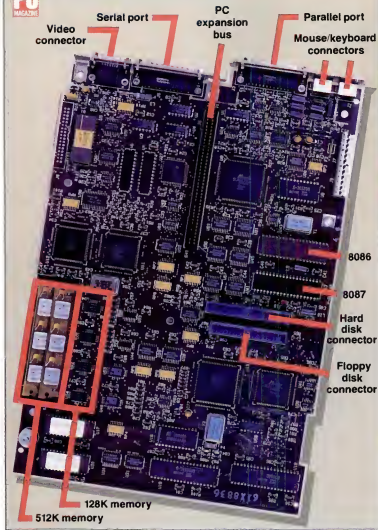


The **BIOS Disk Seek** benchmark test measures the time it takes to do a random seek using the disk's ROM BIOS. The test result includes minimal software overhead and may not parallel the manufacturer's claimed average access time. The test program performs 1,000 seeks. The average result is shown in milliseconds.



PC  
MAGAZINE

## PS/2 Model 30 System Board



8503 (\$250), 12-inch color Model 8513 (\$685), 14-inch color Model 8512 (\$595), or 1,024- by 768-pixel-capable 16-inch Model 8514 (\$1,550).

You'll get MCGA—not VGA—graphics, an enhanced CGA standard that has a color text mode better than EGA's (640 by 400, instead of 640 by 350) and offers a new 256-color mode (at a VCR-like resolution

of 320 by 200) that far outstrips anything the EGA can muster in generating color images. The machine has the potential to be a dazzler when software designers catch up.

Disk compatibility is certain to bedevil your office unless you invest in an external 5¼-inch floppy disk drive (\$395 with adapter) for this machine or a 3½-inch, 720K-byte disk

drive (\$170) for your other PCs.

Once they are copied to the smaller media, XT and AT programs will run fine in the new machine. Make sure that all of your software is registered now, because PS/2-related updates for major applications are on the way.

Expect to have problems sharing disks with the Model 30's more-mature siblings: the

PC  
MAGAZINEFACT  
FILE

**Personal System/2 Model 30**  
IBM Corp.

Consult your local authorized IBM dealer.

**List Price:** Model 30-010 with two disk drives, \$1,695, Model 30-020 with one floppy and one hard disk drive, \$2,295.

**Requires:** A Personal System/2 monitor, DOS 3.3.

**In Short:** A compact, well-built 8-MHz machine that bridges a gap between IBM's PC line and the Personal System/2 family, and offers its own new graphics standard, MCGA.

CIRCLE 426 ON READER SERVICE CARD

50, 60, and 80 all use 1.44-megabyte 3½-inch drives. These drives can read 720K-byte, but if they write to high-density disks, the Model 30 won't be able to read them. I experienced problems reading 720K-byte disks that had been formatted in an external 720K-byte drive. The problems probably are a result of formatting the disks under DOS 3.2 and trying to read them under DOS 3.3, but 3.3 was supposed to improve control of 3½-inch media, not hamper it.

The biggest adjustment for XT and old AT owners is likely to be in using the 101-key enhanced keyboard introduced with the 8-MHz AT. It's now standard across IBM's entire workstation line, so there's no getting around it.

Anyone looking to buy an inexpensive computer will want to look hard at the Model 30. With a CPU weight of 15.7 pounds, it's light enough to be moved often. At 16 inches wide by 15.6 inches long by 4 inches high, it's small enough to be unobtrusive. And at a noise level of 38 decibels, it's 4 decibels quieter than an AT. It even comes with the cache of an AT-style system lock-and-key.

Just as soon as dealers discount it, the Model 30 will be a good buy for anyone not interested in using the next generation of operating systems. □





## IBM Personal Computing, a 6-Year History

The original PC packed a whopping 16K bytes of RAM, considered a lot in 1981 but not even enough to boot today's DOS. The base configuration was intended for use with a television display and cassette drive, thus no disk drives were included. That ground-breaking PC could be expanded to 256K bytes of RAM and two 160K disk drives. Before long, every user shelled out at least \$750 for a 160K disk drive and \$345 for a monochrome display, and \$415 for an additional 48K RAM. Add-in board manufacturers grew up overnight to satisfy the demand for more memory.

By early 1983, IBM responded by introducing the PC-XT with a Seagate 10-megabyte fixed disk and a base memory of 128K RAM. The XT's base memory could be upgraded to 256K RAM on the motherboard, and IBM supported the edition of 384K on an expansion board, bringing total system RAM to 640K.

The first real speed increase from a 4.77-MHz clock speed came with the introduction of the 5-MHz AT in August of 1984, base configured with 256K RAM on the motherboard and with one high-density 12-megabyte floppy disk drive. An enhanced configuration offered 512K RAM on the motherboard and a 20-megabyte fixed disk for \$5,795.

IBM boosted its AT speed to 8-MHz in 1986. The PC-XT Model 286 was the first IBM product to offer 640K in a base configuration, but neither the XT 286 nor the high-end RT PC gained the widespread acceptance of the PC, XT, or AT.

The new Personal System/2 line represents a significant revamping of IBM personal computers. The low-end 8-MHz Model 30 uses the PC-XT bus but is faster, smaller, and more affordable than its ancestors. Models 50, 60, and 80 boast a new bus—the micro channel architecture—designed to handle data flow more efficiently. The Model 80 can address up to 16 megabytes of RAM, and the forthcoming 80-111 will run the 80386 processor at 20 MHz. All System/2 models include color graphics support on the motherboard and use analog signals for the display.

### August 1981

#### IBM Personal Computer (PC)

- \$1,565
- 8088-based, 16K RAM
- no disk drives
- \$2,880 with 64K RAM and one 160K-byte floppy disk

### March 1983

#### IBM PC-XT

- \$4,995
- 8088-based, 128K RAM
- one 360K-byte floppy disk, 10-Mbyte fixed disk

### October 1983

#### IBM PCjr

- \$699
- 8088-based, 64K RAM
- no disk drives
- enhanced graphics support
- \$1,269 with 128K RAM and one 360K-byte floppy disk

#### IBM 3270 PC

- \$4,290
- 8088-based, 256K RAM
- one 360K-byte floppy disk

#### IBM PC-XT Model 370

- \$8,995
- 8088-based, 768K RAM
- one 360K-byte floppy disk, 10-Mbyte fixed disk

### March 1984

#### IBM Portable PC

- \$2,895
- 8088-based, 256K RAM
- two 360K-byte floppy disks

### August 1984

#### IBM PC AT

- \$3,995
- 80286-based, 256K RAM
- one 1.2-Mbyte floppy disk

### January 1985

#### IBM RT PC

- \$11,700
- IBM 32-bit RISC processor, 1 Mbyte RAM
- one 1.2-Mbyte floppy disk, 40-Mbyte fixed disk

### April 1985

#### IBM PC Convertible

- \$1,995
- 80C86-based, 256K RAM
- two 720K-byte floppy disks

### September 1986

#### IBM PC-XT Model 286

- \$3,995
- 80286-based, 640K RAM
- one 1.2-Mbyte floppy disk, 20-Mbyte fixed disk

### April 1987

#### IBM Personal System/2

##### Model 30-002

- \$1,095
- 8086-based, 640K RAM
- two 720K-byte floppy disks
- MDA-CGA display support

##### Model 30-021

- \$2,295
- 8086-based, 640K RAM
- one 720K-byte floppy disk, 20-Mbyte fixed disk
- MDA-CGA display support

##### Model 30-021

- \$3,595
- 80286-based, 1 Mbyte RAM
- 1.44-Mbyte floppy disk, 20-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support

##### Model 60-041

- \$5,295
- 80286-based, 1 Mbyte RAM
- 1.44-Mbyte floppy disk, 44-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support

### Available Summer 1987

##### Model 60-071

- \$6,295
- 80286-based, 1 Mbyte RAM
- 1.44-Mbyte floppy disk, 70-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support

##### Model 80-041

- \$6,995
- 80386-based, 1 Mbyte RAM
- 1.44-Mbyte floppy disk, 44-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support

##### Model 80-071

- \$8,495
- 80386-based, 2 Mbytes RAM
- 1.44-Mbyte floppy disk, 70-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support

### Available Fall 1987

##### Model 80-111

- \$10,995
- 80386-based, 2 Mbytes RAM
- 1.44-Mbyte floppy disk, 115-Mbyte fixed disk
- MDA, CGA, EGA, and VGA display support



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# Personal System/2 Gives Life To a Smarter, More Agile DOS

## PC HANDS ON

BY PAUL SOMERSON

Each time IBM introduces a new line of hardware it bumps the DOS release up a notch. The XT jumped 1.1 users to the 2.0 version that understood hard disks and subdirectories. The AT's need for high-density floppies and larger hard disk storage, combined with network requirements for things like file sharing, brought on 3.x.

DOS 3.3 makes it easier to use both 720K bytes and the new 1.44-megabyte 3½-inch disks, but with reservations. In the past 6 years IBM has endorsed five different disk types. But out of the 25 different possible combinations of using the DISKCOPY command to move information from one to the other, 16 won't work.

Still, DOS 3.3 is smarter and much more versatile than previous releases. For the first time, it sets a default number of disk buffers based on your system's disk and memory storage. Under previous versions, the default was always 2 for non-ATs

or 3 for ATs. DOS will sniff out what hardware you have available and allocate from 2 (minimal RAM and no high-density floppy disks, 3½-inch disks, or hard disks) to 15 (any machine with 512K bytes or more of RAM).

IBM offers a new, complex international-character display feature called Code Page Switching, which works only on EGAs, PC Convertible LCD displays, new PS/2 displays, IBM Printers, and IBM QWERTYs. The manual admits "you can use code page switching without fully understanding everything about it," which is clearly going to be the case for most users. English speakers get off the hook easy and can ignore all this; residents of French-speaking Canada, Denmark, Norway, or Portugal will have to juggle these new files along with the new inscrutable code page commands CHCP and NLSFUNC and the enhanced GRAFTABL and MODE. In addition, KEYB has been streamlined, through the addition of a KEYBOARD.SYS command. DOS

3.3 users won't have to clutter up their DOS directories any longer with templates for Italian or German keys.

The most welcome new command of all is undoubtedly APPEND. Previous editions let you create a PATH that would tell DOS where to look for executable files so DOS could find and execute any program you wanted—unless the program happened to need a nonexecutable file, such as an overlay, to run properly. Moreover, DOS couldn't search the specified path for data files. Version 3.1 users could brute force their way around this obstacle in certain cases by using the SUBST command to fool a program into treating subdirectories as logical disk drives with drive letters.

APPEND simply extends the power of PATH to nonexecutable files. Actually, it's not all that simple. You can load the APPEND string into memory, after which it is treated like an internal DOS command. Or you can have DOS insert the string into the environment space. Adding the string to the envi-

## PC FACT FILE

### PC-DOS 3.3

IBM Corp.  
Consult your local dealer.

List Price: \$120; upgrade, \$75.

In Short: This latest upgrade to DOS, prompted by IBM's PS/2 family, offers more flexibility. Not copy protected.

CIRCLE 424 ON READER SERVICE CARD

ronment makes it accessible to any program run under the current command processor, and you can use APPEND and SET to view or modify the string. But if you (or your program) load an additional command processor, or exit the current one, DOS won't know about the APPEND string. However, if you decide to use the internal method, you'll be able to view or alter the string only with the APPEND command. You can opt for either method or both.

Before Version 3.3, users of IBM equipment with on-board clocks had to drag out the SET-UP program on the diagnostics disk just to reset the time and date permanently. The DOS 3.3 DATE and TIME commands now do this for you.

With so many possible subdirectories and files on a typical hard disk, DOS can have a difficult time searching through paths and directories to figure out where files are. The new FASTOPEN command creates a table of recently opened files that lets DOS jump directly to the file's location on the disk. The table can contain up to 999 entries per hard disk, after which it starts getting rid of the least recently used files and adding the most recently used ones. Each entry eats up 35 bytes, so a full table can span 34K.

One of the best pieces of news for many users is that DOS 3.3 supports up to four serial ports (OS/2 will support as many as eight). One of the worst is that IBM has idiotically moved all of the references to DEBUG (as well as LINK and EXE2BIN), conspicuous by

(continues on page 51)

## The IBM Obfuscation Elimination Facility

IBM is different from you and me—it talks funny. It's no wonder that IBM has problems hooking up different systems in its computer line to communicate with each other. IBM officials usually can't communicate with other human beings.

PC Magazine has come up with a solution. To commemorate the April 2 introduction of the Personal System/2, PC Magazine is proud to publish Release 1 of *The IBM-to-English Dictionary*, or (in the spirit of the subject) *The IBM Obfuscation Elimination Facility*. Here is the first installment.

### What IBM Calls It

### What It Really Is

Planar Board	.....	System board
Micro Channel Architecture	.....	Personal System/2 bus
Asynchronous Communications Adapter	.....	Serial port
Dual Asynchronous Adapter	.....	Two serial ports
Direct Access Storage Device (DASD)	.....	A disk
Fixed Disk	.....	A hard disk
Fixed File	.....	A hard disk
Data Migration Facility	.....	A cable
Memory Expansion Kit	.....	Overpriced RAM chips
SolutionPac	.....	Bundled hardware and software
Operating System/2	.....	DOS 5
Presentation Manager	.....	Microsoft Windows
Systems Application Architecture	.....	Compatibility
TopView 112	.....	Unhealthy nostalgia
IBM/Microsoft Joint Development Agreement	.....	Arm-twisting
IBM-Designed VLSI	.....	See you in court





**PROBLEM:** The more experience your hard disk has, the harder it has to work.

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Remember the old days when your hard drive was new? Remember that smooth, fast, slick performance! Those quick retrievals, rapid saves, lightning-like database sorts?

Well ever since, DOS has been doing its best to slow your hard drive down. Not by slowing down the motor, but by breaking your files up into pieces. Storing different chunks in different places. Data files, programs, overlays and batches that started out in one seamless piece are now scattered all over.

Loading is slower.

Sorting is slower.

Retrieving, backing-up.

Everything takes longer because your disk has to work harder.

Problem is, it's something that happens so gradually you may not notice the difference. At least, not until you see the dramatic improvement after using Disk Optimizer.

**File fragmentation—It's a problem you can see.**

Watch your hard drive the next time it reads or writes a file. Each "blip" of the LED means the drive-head is moving to another place on the disk—either to pick up or lay down another chunk of data.

And the truth is, head movement takes time. Far more time than actual reading and writing. What's worse, all this head movement causes extra wear and tear that can shorten the life of your drive.

**Disk Optimizer—Tunes up your disk by cleaning up your files.**

Disk Optimizer works by finding all the scattered pieces of your files and putting them

back together where they belong. Next time your drive reads it, there's just one place to look.

And the results are often dramatic. Reading and writing times may be cut by as much as two thirds. Database sorts that used to take hundreds of head moves now proceed quickly and efficiently. And since head movement is now at an absolute minimum, your disk drive will lead a longer, more productive life.

**Analyze, scrutinize, optimize.**

Before you optimize, you'll probably want to analyze. So Disk Optimizer shows you, in percentages, how much fragmentation has taken place—on the

entire disk, in individual directories, or for groups of files you specify using global or wildcard names.

Plus, there's built-in data security that lets you assign passwords to as many files or file groups as you want.

And the File Peeker gives you an inside look at the structure of files. It's a great way for non-programmers to learn more about computers and a powerful tool for professionals who want to analyze the contents of their disks.

**Get your hard disk back in shape—with new improved Version 2.0**

Hard to believe, but new Disk Optimizer Version 2.0 is

even better than before. Not only will it optimize your disks in far less time than it used to, but it actually speeds up retrievals even more by letting you give priority treatment to your most used files, like programs and batches.

When you think about it, it's simple.

The longer you own your hard drive, the more you come to depend on it. But the longer you wait to get Disk Optimizer, the less performance you'll get.

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Reference Speed	2 x XT	6.5 x XT	3 x AT
Accelerator Type	Replace 8088	Co-processor	Replace 80386
CPU	80486	80386	80386
RAM	8 K Cache	1 or 2 MB SMD	64 K Cache



### GET THE EDITOR'S CHOICE: TinyTurbo 286."

The TinyTurbo 286" supercharges your XT to run *three times faster*. Yet it's so small it takes up only half a slot in your computer. Just two reasons why *PC Magazine* named it the Editor's Choice.

TinyTurbo 286 gives you a high level of compatibility. So you can run software like Lotus and Windows—with EGA graphics, EMS memory, or networking cards—at AT speed. You can even go back to your PC's regular 8088 chip, which remains in the system, giving you 100% hardware compatibility.

### ADD AWESOME PERFORMANCE: PCturbo 286e."

For power users, the front runner today in accelerators is clearly the PCturbo 286e." It revs up to *6.5 times faster* than an XT, or up to *2 times* AT speed—giving you the world's fastest screen I/O. Plus the PCturbo 286e comes factory equipped with 1 Megabyte of fast RAM, expandable to 2.

The PCturbo 286e is also a powerful tool for developers and systems integrators. With features like an optional 10-MHz 80287 math chip, and coprocessing software for concurrent foreground, background tasks, the PCturbo 286e lets you build minicomputer-like performance into standard PCs.

### MOVE YOUR AT UP TO 386 HORSEPOWER NOW: Jet 386."

Take a look today at the price/performance leader in desktop computing: the Jet 386." Depending on the application, it's up to *three times faster* than an AT. And *twice as fast* as some high-performance minicomputers. Yet you don't have to buy an expensive 386-based computer to get this kind of horsepower.

More importantly, the Jet 386 uses next generation technology, the 80386 microprocessor. So you can run all of the current software for the AT now, and 386 software too. Add a Jet 386 to your AT today, and you can extend the life of your investment—for a fraction of the cost.

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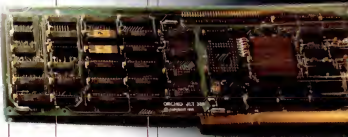
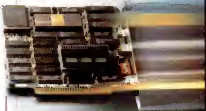
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XT Speed



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Circle R. S. 305 for PCturbo 286e  
Circle R. S. 306 for Jet 386

3 x AT 6.5 x XT

3 x XT



## DOS 3.3

(continued from page 48)

their absence, to the DOS Technical Reference Manual.

The STACKS command comes out of the closet with 3.3. With Version 3.2, you could easily bring your machine to its knees by pounding on the keyboard too rapidly—and the only mention of the command that fixed the problem was isolated at the very end of the manual in a special appendix two pages long. With 3.3 it's at least moved to the CONFIG.SYS section, although the explanation is nearly as opaque as in previous editions. FDISK has also been moved from the front of the manual to where it belongs in the reference section.

FDISK now allows you to create two types of partitions—primary (the kind allowed by earlier DOS versions) and extended. Extended partitions are necessary on large hard disks; they allow users to lop off a massive amount of physical partition space and subdivide it into "logical" drives, each with its own drive letter all the way to drive Z.

The DOS BACKUP command has always been so pathetic that an entire industry of third-party backup software has evolved to fill in the gaps. While the 3.3 enhancements aren't going to put all those developers out of business, they will bring some users back into the fold. Under previous DOS versions you had to format a tall stack of disks before starting the backup process. If you ran out of formatted disks, you had to abort and either find a way to catch up or start the whole elaborate, time-consuming procedure over again.

Under DOS 3.3 you can have BACKUP summon the FORMAT command and prepare unformatted disks if necessary—with certain restrictions. FORMAT.COM has to be on your disk in a subdirectory your PATH knows about. And you have to match disk and drive sizes; it can't handle a 360K-byte disk in a 1.2-megabyte drive. The new BACKUP works faster, by copying all smaller files to a single enor-

## As New Models Arrive, Old Prices Drop

IBM did not neglect its existing line of PC-XTs and ATs when it introduced the Personal System/2 on April 2. It dropped prices on its full line of existing Personal Computers.

The cuts ranged from 35 percent off its base PC-XT

model to 9 percent off its 3270 PC ATs.

An IBM spokesman said that all models will be manufactured for as long as demand continues.

The following is the current IBM Personal Computer product line.

## IBM Personal Computers

	Old List Price	New List Price
IBM PC Convertible	\$1,995	\$1,695
IBM PC-XT Model 268	2,145	1,395
IBM PC-XT Model 278	2,295	1,545
IBM PC-XT Model 285	3,395	2,810
IBM PC AT Model 319	5,295	4,595
IBM PC AT Model 339	5,295	4,595
IBM PC AT G	7,510	6,810
IBM PC AT X	7,510	6,810
IBM 3270 PC Models 070, P70	4,435	4,200
IBM 3270 PC Models 071, P71	5,445	5,210
IBM 3270 PC AT Models 070, P70	7,140	6,440
IBM 3270 PC AT Models 071, P71	7,870	7,170

mous one called BACKUP.XXX and by creating a guide file called CONTROL.XXX that tells DOS how to take the big file apart and restore it properly later. Previous versions let you back up after a specified date; with 3.3 you can also back up files created after a certain time. And the new BACKUP will create a log file telling you what it did where.

The new RESTORE gives you a tremendous amount of flexibility in restoring backed-up files by date and time, as well as files deleted or changed since you backed them up or files that are no longer on the target disk. Better yet, while older versions of RESTORE let you obliterate your current system files (IBM.BIO.COM, IBM.DOS.COM, and COMMAND.COM) with older backed-up versions, 3.3 RESTORE won't.

To make backups easier, DOS 3.3 ATTRIB now accepts wildcards and can change the directory attribute of all files in a subdirectory and in daughter subdirectories. Sadly, it still works just with archive bits and read-only bits; you can't have it hide or unhide a file.

Version 3.3 is the first version of DOS to recognize the previously undocumented but widely known technique of accessing environment variables by sandwiching them between percent signs. So if you issue the command SET MAGAZINE=PC to place the string MAGAZINE=PC into the environment, and then include a line in a batch file that says ECHO %MAGAZINE%, the batch file will print: PC.

Another poorly documented favorite of power users is the ability to nest batch files by loading additional command processors, and then pass parameters between them. PC Magazine's Productivity section has published many elegant tricks based on this technique, for tasks like displaying all files on a disk one by one and then erasing or copying files selectively. DOS 3.3 users no longer have to bounce through additional command processors; they can take advantage of the new CALL command instead.

Virtually all serious batch file users start all batch files with the command ECHO OFF to suppress DOS command

screen clutter. Unfortunately, with previous DOS versions, the very command that prevented commands from displaying had to be displayed itself. Now, by prefacing any batch file command with an @ symbol, you can prevent that command from appearing on-screen. So starting all your 3.3 batch files with @ECHO OFF disables the ECHO feature without telling the world you're doing so.

The 3.3 FORMAT command now lets you specify the number of tracks and number of sectors per track to format (on floppy disks only), so you can format a 720K-byte floppy disk in a 1.44-megabyte disk drive. However, to do so, you have to add the switches /N:9 /T:80 to the tail end of the command. It would have been easier to have a single /T switch to handle this.

GRAPHICS now offers an /LCD switch "to print the image exactly as it appears on the IBM PC Convertible Liquid Crystal Display." What does this mean—murky and unreadable?

When the EGA was introduced, users complained that the MODE command couldn't handle the new graphics settings (such as 43 or 50 lines or the better color selection). Now that an even jazzier color standard is out, you'd think DOS could handle something past CGA. Guess again.

DOS 3.3 now issues a chilling variation on the old "Abort, Retry, Ignore?" message when tripping over an FCB/file sharing problem: "Abort, Fail?" What a choice.

Some explanations are welcome, if still misplaced. Early on the manual now warns that the command DEL FILENAME.\* will exchange both files that have single-character extensions and files with no extensions at all. And while earlier versions hid the information about using SHELL to increase environment size, SET now steers users to it.

The price is high—\$120—and you may need the \$85 DOS Technical Reference Manual. But current users can upgrade for \$75, and—if you're a serious user—the improvements are well worth it.



## ■ NEW ON THE MARKET ■ JONATHAN MATZKIN

**Group III Facsimile Communications for PC Costs \$595 at 2400 bps**

Systems that bring fax capability to PCs have been around for a while, but a new hardware/software product from Brooktrout Technology has been announced at a significantly lower entry-level price than competing systems.

Fax-Mail 24, the lowest priced of three Brooktrout fax systems, costs \$595 and can transmit at up to 2,400 bits per second. Fax-Mail 48 (\$795) transmits at up to 4,800 bps. The Fax-Mail 96 (\$995) transmits at 9,600 bps.

All three units are compatible with Group III fax technology. The Fax-Mail 96 is also compatible with Group II fax machines.

Brooktrout supplies menu-driven software that enables the user to transmit and receive messages, store them as files on disk, display them on a monitor, or print them out. The software also provides for automatic fax operation. The system works in the background, so the PC is not dedicated when sending and receiving messages.

**List Price:** Fax-Mail 96, \$995; Fax-Mail 48, \$795; Fax-Mail 24, \$595. **Requires:** 512K RAM, CGA or Hercules-compatible graphics card and monitor, DOS 2.0 or later. Brooktrout Technology Inc., 110 Cedar St., Wellesley Hills, MA 02181; (617) 235-3026.

CIRCLE 422 ON READER SERVICE CARD

**Dot Matrix Printer Can Stop Fanfold Printing To Print Single Sheets**

Small details of convenience can smooth the relationship between man and machine, or, more specifically, user and printer. The \$1,995 C7400 dot matrix printer, from Facit, sports one seemingly small advantage that could make the user's life less frustrating.

The 400-character-per-second printer has a "parking" capability that interrupts fanfold paper printing to allow feeding of single sheets. After the sin-

gle-sheet printing is finished, the Facit C7400 automatically reloads the fanfold paper and resumes printing, according to Facit.

The 18-pin printer handles near-letter-quality printing at 100 cps, Facit says, and comes standard with both push and pull tractors.

Epson FX and JX emulations are standard, and IBM Graphics Printer emulation is available as an option. The printer has both serial and paral-



The \$1,995 Facit C7400 dot matrix printer has a unique paper "parking" capability that allows you to feed single sheets without removing fanfold paper.

**HOT PROSPECT****IBM Unveils the WORM Optical Disk Drive, New Quietwriter, Laser Printer**

Almost lost among the sweeping introduction of IBM's Personal System/2 computers are three peripherals that are scheduled to be shipped in coming months: an optical disk drive, a laser printer, and an enhanced Quietwriter printer.

The \$2,950 3363 Optical Disk Drive is available for internal use on Personal System/2 Models 60 and 80 or as an external device for existing PCs, XT, ATs, and Personal System/2 machines. The WORM (write once, read many) drive uses 5¼-inch disk cartridges that hold up to 200 megabytes. Average seek times are in the range of 230 milliseconds.

The \$1,699 Quietwriter III is a quieter, faster printer that offers condensed fonts (17.1 characters per inch), emphasized printing, double-strike print modes, and additional type font styles.

The \$2,199 Personal Pageprinter is a tabletop-

sized laser printer (16.46 by 8.37 by 17.68 inches, 35 pounds) that's capable of printing 6 pages per minute (after a 25-second setup time for the first page). The printer requires a \$1,950 Personal Pageprinter Adapter and either IBM's \$850 Personal Pageprinter Adapter programs or other PostScript drivers. IBM expects to ship the printer in the fall.

The Personal Pageprinter is capable of 300-dot-per-inch resolution.

**List Price:** 3363 Optical Disk Drives, Models A11 and A01, \$2,950; Quietwriter III, \$1,699; Personal Pageprinter, \$2,199; Personal Pageprinter Adapter, \$1,950. **Requires:** An expansion slot (for 363 Optical Disk Drive), a full expansion slot and PostScript drivers (for Personal Pageprinter). IBM Corp., Information Systems Group, 900 King St., Rye Brook, NY 10573; (800) 447-4700.

CIRCLE 426 ON READER SERVICE CARD

New optical disk drives from IBM (\$2,950) store up to 200 megabytes per data cartridge (\$65) for write-once storage. Up to eight drives can be configured in a single system for a total mass storage of more than 1.5 gigabytes.



el interfaces, as well as a 4K-byte buffer.

**List Price:** Facit C7400, \$1,995. Facit Inc., 9 Executive Dr., Merrimack, NH 03054; (603) 424-8000.

CIRCLE 423 ON READER SERVICE CARD

**Zenith Board Lets PCs Communicate in LAN Across Long Distances**

Zenith Electronics Corp. has added the Z-LAN 500c LANcard to its local area network product line. The \$695 card enables PCs to communicate at .5 megabits per second in Zenith's Z-LAN broadband local area network system. The LANcard allows complete peer-to-peer PC connectivity throughout a 30-mile area, according to Zenith. The LANcard also provides universal connectivity to other devices on the network.

The LANcard installs in a PC expansion slot and contains a NETBIOS standard network interface and an 80188 processor. The processor allows communications to be offloaded from the PC to the LANcard. The card is sold with a specially designed external modem that provides the interface to the Z-LAN broadband network.

**List Price:** Z-LAN 500C LANcard, \$695. **Requires:** Z-LAN broadband local area network system. Zenith Electronics Corp., 1000 Milwaukee Ave., Glenview, IL 60025; (312) 699-2199.

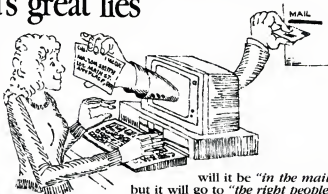
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## ■ PC UPDATE ■ PEGGY GAVAN

Microsoft Corp. is shipping all of its applications software and programming languages on 3½-inch floppy disks, which will run on IBM's Personal System/2 or other 3½-inch disk drives (including those on popular laptops), while continuing to distribute 5¼-inch floppy disks. *Microsoft Word*, Version 3.11, *Microsoft Network Word*, Version 3.11, *Microsoft Multiplan*, Version 3.02, *Microsoft Project*, Version 3.01, and *Microsoft Chart*, Version 2.03, will be shipped with both floppy disks. *Microsoft Flight Simulator* will be available in the smaller format this summer. Microsoft programming languages—BASIC, FORTRAN, C, and Pascal—will continue to be shipped on 5¼-inch floppy disks, although users can request a free 3½-inch disk replacement. Microsoft Corp., Redmond, Wash.; (206) 882-8060.

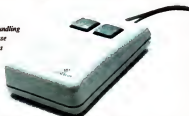
Epson America has enhanced the speed and expandability of its **Equity 1** PC compatible with the introduction of the **Equity 1 Plus**. The enhanced machine includes an Intel 8088-2 microprocessor, 640K bytes of RAM, five 8-bit expansion slots, and an enhanced-AT-style keyboard. The **Equity 1 Plus** is also priced \$300 more than the **Equity 1**: the base model with one floppy disk drive costs \$1,095; a second model with dual floppy disk drives costs \$1,295; a third model with one floppy disk drive and one 20-Mbyte fixed drive is priced at \$1,695. Epson America, Torrance, Calif.; (213) 534-4500.

C. Itoh Digital Products has upgraded its **ProWriter Jr.** dot matrix printer to the **ProWriter Jr. Plus**. The **Plus** model has an increased speed of 160 characters per second in draft mode, an increased throughput speed of 61 lines per minute, and 8K bytes of buffer memory. In addition, the new model allows users to insert cut sheet forms without removing the continuous paper from the tractor-feed sprockets. The **ProWriter Jr. Plus** is priced at \$369. C. Itoh Digital Products, Torrance, Calif.; (213) 327-2110.

**SOS**, Version 1.2, is compatible with **I-2-3**, Release 1A and 2.x, **Symphony**, **HAL**, and **SuperCalc4**. The new version also has several new features, including a warning to prevent accidental loss of data in RAM, an on-line menu for selecting **SOS** features, and an option to remove the program from memory. **SOS** is priced at \$59.95, and upgrades are \$20 for registered users. Goldata Computer Services Inc., Bryn Mawr, Penn.; (215) 525-1036.

Quadram Corp. is bundling its **QuadEGA ProSync** graphics board with its **Q-Mouse** optical mouse and coupons to purchase *Microsoft Windows* and *GEM Desktop/GEM Graph* for \$30 each. The total package, which has a retail value of \$1,074, will sell for \$595, the price of the board alone. Quadram is also bundling coupons for the

Quadram Corp. is bundling a free optical Q-Mouse and discount coupons for Windows, GEM Desktop, and GEM Graph with its QuadEGA ProSync graphics board.



mouse and the software with its \$495 **QuadEGA Plus** board. In addition, the company is shipping free upgrade kits to **QuadLaser 1** owners that provide printer emulation for the HP Laserjet, Laserjet Plus, Qume Sprint 5, IBM Proprinter, and Epson FX-80. Quadram Corp., Norcross, Ga.; (404) 923-6666.

**Fancy Ward**, Version 3, has several new features, including a graphics command that allows users to include screen-captured images, *PC Paintbrush* files, *Microsoft Windows* clipboard pictures, and *Windows/Aldus* TIFF files in **Fancy Ward** documents. The new version also supports HP and Bitstream Soft Fonts and up to 256 characters in SoftCraft fonts. **Fancy Font**, Version 3.0, allows users to include graphics in a document and includes fonts from Bitstream. Registered users can upgrade to **Fancy Word**, priced at \$140, and **Fancy Font**, \$180, for \$25 each. SoftCraft Inc., Madison, Wis.; (608) 257-3300, (800) 351-0500.



The **ProWriter Jr. Plus**, an enhanced version of the **ProWriter Jr.**, has an increased speed of 160 cps in draft mode.

In brief: Lotus Development Corp. has extended its upgrade program for **Symphony**, Version 1.2, indefinitely. The upgrade program allows registered users of **Symphony** to upgrade to Version 1.2 for \$75. Lotus Development Corp., Cambridge, Mass.; (617) 577-8500...Key Tronic Corp. has introduced an end-user version of its **KB101** 101-key keyboard. The keyboard retails for \$159. Key Tronic Corp., Spokane, Wash.; (800) 262-6006...**Windows in-Talk**, Version 1.1, requires only 128K bytes of RAM and has a "snap-style" scrolling feature for faster screen updates. The new retail price for Version 1.1 is \$195; upgrades are free to registered users. Palantir Software, Houston, Tex.; (713) 955-8880...Office Automation Systems has reduced the price on the **LaserPro 810** and the **LaserPro 1510** printers. The 810 model dropped \$400, to \$4,595, and the 1510 model was reduced \$520, to \$7,295. Office Automation Systems Inc., San Diego, Calif.; (619) 576-9500...Daybreak Technologies has increased the price of its **Silk** spreadsheet from \$149 to \$298. Daybreak Technologies, Torrance, Calif.; (213) 212-3030...Core International has cut the prices on its hard disk drives. The price of the **AT Plus** internal hard disk was reduced \$500, and the **HC Series** disk drives were cut \$1,000. Core International, Boca Raton, Fla.; (305) 997-6055...**Timepiece**, Version 1.3, has a custom graphics interface with line styles, patterns, and a color palette. The new version is also compatible with Xerox's **Ventura Publisher**. Upgrades are \$50 for current users. CDI, Portland, Ore.; (503) 684-5151...Digital Learning Systems has added the **KeyNotes Writer's Handbook** language and dictionary to its **KeyNotes** line of productivity software. The handbook is priced at \$29.95. Digital Learning Systems, Parsippany, N.J.; (201) 538-6640...Conetic Systems has added an enhancement to its **Higgins** integrated LAN software that notifies a user of arriving electronic mail when another program is running. The new feature, called **Higgins MailCall**, is free to new buyers and current owners of **Higgins**, Version 2.1. Conetic Systems Inc., San Leandro, Calif.; (415) 430-8875...BDT Products has enhanced its **LaserFeeder** sheet feeder, making it compatible with the HP Laserjet 500 Plus. The **LaserFeeder Plus** is priced at \$1,795. BDT Products Inc., Irvine, Calif.; (714) 660-1386.



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■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

# THE POLITICS OF PROGRAMMING



*Like politics, programming is an art. Or is it a skill? Whether you choose C or Lotus macros, it's not easy. Yet programming is getting more popular.*

Despite all claims to the contrary, programming is easy. All you do is install the parser, syntax checker, memory model, and architecture of your chosen language in your brain. The rest is a snap.

You see, you really don't teach yourself to program. You teach yourself to be a compiler. If you have a good memory for rules, especially if you're not particular about whether they make any sense, you can be a programmer. Programmers have been described by some as incredibly egotistical. Both Stewart Alsop and John Dvorak have dealt with the subject in these pages. I, however, believe that programming is, at its heart, a selfless task.

Preparing to write code is like going into a trance. Your personality falls away in large chunks. The cares of the workaday world become irrelevant. You subjugate your bodily needs, even your health, to the greater glory of what is about to come. The keyboard becomes an extension of your fingers, the monitor a direct pathway into your brain. Your personal life becomes meaningless, a hypothetical question. The future extends only as far as the next line of code . . . and the one after that.

**UNCHAINED EGO** The real reason programmers appear to be so egotistical is because of their subjugation to the rite of programming. As they emerge from the code trance, they must reassemble their egos piecemeal. Sometimes they leave a few rough edges. Sometimes the session didn't go well and they're still partially immersed in the other world. Besides, what

challenges does a conversation in English hold after you've negotiated the perils of a language like C?

With this mental model of a mental model in mind, we can examine in more depth why some programming languages are easier than others. Take interpreted BASIC, for instance. BASIC's syntax is no easier than that of any other language. Programming in BASIC is easier because you don't have to become as fully engaged with it. You write a line of code and the machine executes it. Then you look up the syntax for the next one in the manual. You can test as you go. You either enter commands in direct mode to see what they do, or you run small chunks of the program at a time. The mental commitment is far lower, and the process is ideally suited to occasional programming and to learning.

Programming for any compiler is different. If you're to be even slightly productive, you have to know the entire syntax

and grammar of the language. It's unproductive to continually interrupt yourself as you write code, just as it's tough to express yourself in writing if you must continually refer to the dictionary or a thesaurus. While some languages are definitely easier to program in than others, the difference is more likely to be dependent on what you are attempting to do than on the language.

Record and file I/O, for example, is easiest in COBOL and PL/I. They were designed from the ground up to be business data processing languages, although PL/I has extensive scientific capabilities. Convoluted logic is best handled in Pascal. Its coolheaded Case statements, nested operations, and structure impose order on the thorniest problems. Bit-bashing is best done in C and assembly language. Both let you get right down to the machine's registers without a lot of nonobvious tricks and fooling around.

Becoming proficient in these languages is very similar: You learn the assignment operators, the variable declarations, control statements, functions, grammar, syntax, and punctuation. You teach your brain to function just as the compiler would, checking each statement for accuracy and completeness. Your success in becoming a compiler is inversely proportional to the number of error messages you get when you actually compile. Debugging is a harsh taskmaster, and it rapidly reinforces your hard-learned knowledge.

Some languages are hybrids of others. On one level, *dBASE III* is a cross between Pascal and COBOL. It melds the clear logic of one with the record-handling capabil-





## ■ FROM THE EDITOR'S SCREEN

ity of the other. The result is no longer an applications program or a "database package," but a bona fide language. And it's easier to use and to remember than either of its progenitors.

I'll make the argument that I-2-3 is a programming language, too. It has all the requirements: strict syntax, operators, functions, branching, testing, and iteration. It even has variable names. With

named ranges, you can perform operations on a range or a single cell. The biggest problem with I-2-3 is that it's harder to visualize what it is doing than with most languages. The cell references are only locations in two-dimensional space, and they are usually expressed in relative terms rather than absolute. There's no data typing, so you have little control over whether a specific cell has a number, text, or a macro in it. You can, of course, protect ranges after you set them up, but protected ranges cause as many problems as they solve when you revise a spreadsheet.

It's tough to hold the rulebook in your head as well as a picture of all the data in I-2-3's array. Fortunately, I-2-3 is both visual and an interpreter. You can build up a spreadsheet piecemeal and sort out errors after the fact. The problem is, when you go from programming mode to visual mode, you lose your frame of reference. In many ways, spreadsheets are the antithesis of the progress made in structured programming. The person who finds a way to meld the two will make the second great fortune from spreadsheets.

In the meantime, Jim Seymour has a standing \$50 bet that he can find at least one error in any spreadsheet of significant size or function. As long as I-2-3 requires a bifurcated brain to plumb its depths, he'll collect a lot more than he'll shell out.

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And where we are right now is on the edge of a tremendous upsurge in languages. The old dream of programmerless applications generators is hollow: any applications program worth its salt today has an underlying programming or macro capability.

Anything else, after all, would be . . . well . . . easy.

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# 3



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3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with
  1. Front side touching the free page
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1. Follow instructions on the other side

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**Back**

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We're pleased you did.

Over three million IBM® PCs have been put to work, doing everything from financial analysis to first-grade arithmetic.

Yet as PCs grew more popular, and as we kept improving them, one thing became clear. You needed more.

You're in a hurry, so you want PCs

You want improved reliability.

And you want all this without obsoleting your investment in equipment, software and training.

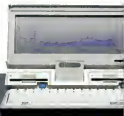
So there was only one thing we could do: create a whole new system for personal computing.

The new IBM Personal System/2™

Its heart is a new line of hardware and software, but its soul is bigger; new technology, of course, but also a new "balanced system" approach for

*IBM Proprinter II*

*IBM Proprinter X24*



*Programs are here for the IBM Personal System/2.*

to respond faster.

You do many things at once and wish your PCs could too.

You want software that's more powerful, but also easier to use.

You'd like more color.

You're eager for your systems to communicate with other systems.



*IBM PC Convertible*

making things work together.

It works with earlier IBM PCs so your investment is protected. It works with larger IBM systems so your future growth is protected. It works for business and education, for professional people of every stripe.



# Introducing the IBM Personal System/2









"colorful" and "sharp." And new displays that give your programs a heightened sense of reality.

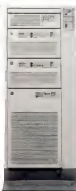
### **The new connectivity.**

There will be new avenues for sharing information; new match-ups of hardware and software that shorten the distances and widen the roads between PCs, minis, mainframes and people.

### **The new media.**

You'll see rugged diskettes that are

*The IBM Personal System/2 is designed for connecting with larger computers like the IBM System/36 and the IBM 9370.*



### **The new printers.**

You'll see an expanded family of



*IBM Proprinter XL24*

*IBM Quietwriter III Printer*

half as big, but hold up to twice as much as floppies did. Plus low-cost devices for transporting your data from one generation into the next. And a new IBM 200MB optical disk drive.

### **The new solutions.**

You'll discover new ways to solve problems; ideas about choosing not just software or hardware, but software, hardware and support in balance.

personal printers that fills just about any need, from economy, to speed, to the fussiest levels of document quality.

### **The new support.**

And because it's not just what you buy but where you buy it, you'll learn how we've been working closely with the people who sell the Personal System/2 to create new levels of dealer support.



1. Follow instructions on the other side

Back

Go55pback-0019



Inverted Back

1. Follow instructions on the other side



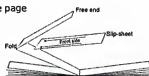
Folded edge of the page



Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
  1. Front side touching the free page
  2. Arrow pointing to the fold
  3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with
  1. Front side touching the free page
  2. Arrow pointing to the fold
  3. Slice the folded edge
4. Close the page and slip-sheet



# personal computing.

other busy persons.

**Model 80.** For everyone who's been waiting to experience the real power of the 80386 microprocessor, it's not just in this computer, we built this computer around it. Available this summer, Model 80 is a 32-bit system that does jobs up to

The rest of this booklet tells more about the IBM Personal System/2. And how, all together, it can help make your professional life easier, more productive, and more rewarding.

## The new performance.

You'll find new architecture, new



IBM Personal System/2 Model 60

three and a half times faster than the IBM Personal Computer AT. Up to 2MB of memory are standard, and fixed disks can be 44, 70 or 115 megabytes big. Or with two fixed disks, 230 megabytes huge. Computers this capable, and connectible, used to fill whole rooms.



IBM Personal System/2 Model 80

integrated design and new operating systems that together lift raw power to higher levels of true performance, while cost goes the other way.

## The new graphics.

You'll see new graphics, all standard, that redefine the words





# So, it's power you want

## The new performance.

It's tempting to size up computers by the numbers, but in the IBM Personal System/2, real performance exceeds the sum of its parts.

Components were designed not just to coexist, but to cooperate; within each system, and within your total computing environment.



*The IBM Personal System/2 takes up less space on your desk. The on/off switch is on the front, and monitors tilt and swivel.*

So your software runs faster, and your system is more reliable.

## Extras aren't extra.

You could expand earlier IBM PCs after you bought them, but the Personal System/2 is expanded before you even open the carton. Things that used to cost extra don't anymore.

Advanced graphics, parallel and serial ports, a port for pointing devices, and diagnostics are included.

And new IBM technology—our one-million-bit memory chip, high-density logic circuits, and integrated “planar boards”—is sending performance up, and costs down.

## Paths to the future.

Models 50, 60 and 80 share a design that's new to personal computing. Technically it's described as parallel bus architecture (we call it IBM Micro Channel™), but think of it as a highway.

Our first PCs were built around a two-lane street. Usually that's enough, but sometimes there are traffic jams. Your sales figures might have to stand on the corner while your mailing list goes by.

The new system is like an expressway. There are more lanes open





in both directions.

The ramps are more smoothly paved, and signals are better synchronized. So data can flow more freely.

This is what the 286 and 386 chips have been waiting for. A highway to match their horsepower.

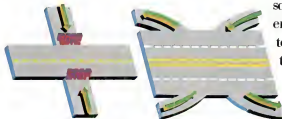
### The new operating systems.

The Personal System/2 is being introduced with a new IBM PC DOS Version 3.3 that lets you tap into the new systems immediately, and works with all previous IBM PCs as well.

There's also an IBM 3270 Workstation Program that, with PC DOS Version 3.3, helps the Personal System/2 connect with



*The IBM Personal System/2 Model 80 was created to unleash the power of the 80386 microprocessor.*



*In earlier PCs, data sometimes had to stop and wait. New IBM Micro Channel architecture is more like an expressway. Data flows more freely.*

mainframes, supports more memory, and lets you run multiple applications.

But much more is coming.

A new IBM Operating System/2™ will run on Models 50, 60 and 80. Available later on, its development is

being carefully timed so that everyone involved—software makers, our dealers, you—can take full advantage of its power as easily as possible. It will do everything our existing PC DOS does (in fact, they'll get along beautifully), but it also will bring major advances.

**Memory.** Our new systems offer up to 16 megabytes' worth, and Operating System/2 will make these vast resources easier to access.

**Multi-tasking.** With IBM Operating System/2, you won't have to be a "power user" to understand how to run several programs at once. Multi-tasking will become a routine experience.

**Software.** Together with the new architecture and more memory, Operating System/2 will give software developers new freedom to create programs that are more powerful, better looking, and easier to use than ever before.

**A bigger idea.** Operating System/2 is also part of another new idea, called IBM Systems Application Architecture.

Its goal is to bring the world of IBM computing closer together; to provide a greater consistency in look, function and feel—for systems, for software and for people who use them. IBM Operating System/2 is the first step for personal computing in this promising new direction.



*IBM Personal System/2 "planar boards" have many standard features that used to be options.*



# It's like having 256,000 in one box.

## The new graphics.

Back in the dark ages of personal computing, the world was ruled by numbers and words. Graphics were a nicety, but rarely a necessity.

Welcome to the Renaissance.

The IBM Personal System/2 has a talent for graphics that's dazzling.

Each new system can paint up to 256 colors on the screen at once, drawing from an incredible palette of over 256,000.

And not one of those colors costs a penny extra.

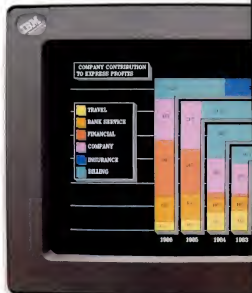
Even in monochrome, things aren't monotonous. There can be up to 64 shades of gray for new dimension and contrast.

And the images themselves are greatly improved. The tiny "pixels"

that create the image can now be tinier, and there can be lots more of them. Even the space between them seems to have disappeared. So pictures are



*The IBM Personal System/2 Monochrome Displays 8503.*



*All screens in this brochure are actual and unretouched.*



# 0 crayons

sharp and clearly defined.

**Better letters.**

Equally important, letters and numbers are clean-edged and precise,



*The IBM Personal System/2 Color Displays 8512.*

looking more like they're printed than projected. After a few hours with your trusty spreadsheet, you'll appreciate that.

You'll also like the non-glare viewing surface, and

mountings that tilt and swivel so your neck doesn't have to.

There are four new IBM displays, and each works with every Personal System/2 computer, all showing graphic improvements in price.

The 12" monochrome and 14" color displays are great for most general-purpose work. The 12" color display is even sharper, ideal for detailed business graphics. And for design work, there's

the big 16" color display with even higher resolving power.

**Your favorite programs.**

Just about any program you can run on the IBM Personal System/2 will look better, and will likely be more pleasant to spend time with. Many other programs are being



*The IBM Personal System/2 Color Displays 8513.*

reworked just to take advantage of the new graphics.

But the future holds real surprises. The screens of the Personal System/2 are like a brand new kind of canvas. How the artists will use them should be something to see.



*The IBM Personal System/2 Model 50 and the IBM Personal System/2 Color Display 8514.*



# The future belongs to well-connected.

## The new connectivity.

The earliest computers were big and costly, so people shared them.

Then people wanted smaller computers just for themselves. Soon PCs were in offices everywhere. And how did people want to use them?



*The managing director uses IBM 3270 Emulation and Professional Office System™ software (PROFS) for checking calendars and sending electronic mail.*

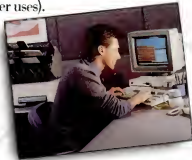


*The personnel director sends bulletins using the IBM 3270 Workstation Program and PROFS.*

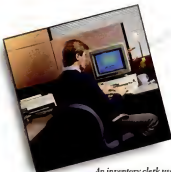
For sharing things. So the idea of PC connectivity was born.

From the start, the IBM Personal System/2 was designed to connect; with other IBM personal systems, with bigger IBM systems.

Each new system comes with built-in asynchronous communications (which can save you an option slot for other uses).



*An executive assistant uses IBM DisplayWrite 4 to polish up memos and reports for distribution through IBM DISOSS.*



*An inventory clerk uses an inquiry to a data base to compare what's out in the warehouse with sales orders.*



# the

So information has no trouble traveling back and forth. But the real news is what happens inside.

## Going with the flow.

The new architecture in Models 50, 60 and 80 will improve the flow of traffic within the system, so when an important message comes in from

corporate headquarters, it's less likely to see stop signs. And if the sender has a properly equipped IBM PC, PC XT, Personal Computer AT or IBM Personal System/2 Model 30,

System/2 Model 30,

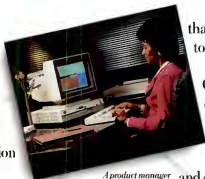
that's okay too—they work together.

And as the new IBM Operating System/2 unfolds, communication will become even easier. Its multi-tasking capability will make it easier for your system to receive and store electronic mail, main-frame data, or whatever, while you're busy doing something else.

The scope of communication has been increased, too.

A wide array of local area network and connectivity products is part of the IBM Personal System/2 family, so your resources can be as broad as your needs; from the first IBM PC your company ever bought, to mid-range systems, to the biggest IBM 3090 mainframe, the lines are open.

And this is just the beginning.



*A product manager loads her spreadsheet using the IBM Token-Ring Network to access information.*



*The IBM 9370 computer stores information and provides data base management support for the business.*



*Programmers work within the framework of IBM Systems Application Architecture to develop applications.*



*A design engineer uses an IBM Personal System/2 Model 80 to create a product accessing designs from the host computer.*



*Meanwhile, from a hotel room, a salesman uses the modem in his IBM PC Convertible to send back details of a new order.*



# IBM just got smaller. three quarter inches.

## The new media.

The amazing 5¼" floppy diskette can hold literally hundreds of pages' worth of memos, reports and vital statistics.

So why are we switching to 3½" diskettes?

Because they hold up to twice the information, and they don't flop. A hard plastic case protects them from mishaps that floppies are heir to.



*A simple accessory kit transports data from 5¼" to 3½" diskettes.*

So not only can you slip a diskette into your shirt pocket, you'll have fewer of them, with more of your work all in one place. You won't have to fool around with write-protect tabs anymore, either. They're built right in.

## Bridging the gap.

Very nice, you say, but what about all that work on 5¼" diskettes?

We thought about that from the very beginning, and we're offering a number of low-cost solutions to make the transition as smooth as possible.



*It takes two 360KB 5¼" diskettes to hold as much as one 720KB 3½" diskette.*

One is a simple cable adapter and software package that lets you send your data from an IBM PC, PC XT or Personal Computer AT to your IBM Personal System/2, then onto the smaller diskettes. Depending on how much data

you have, the whole job could be over in one sitting.

Also available are special IBM 3½" and 5¼" external diskette drives, to be there





# By one and

anytime you need them, for conversions in either direction.

## Software is here.

And what about software? Well, 3½" diskettes may be new to full-sized IBM personal computers, but they're not new to personal computing.

They're used, for example,  
by the IBM PC  
Convertible.  
So, many  
popular  
spread-

sheet, word  
processing, data  
base and other programs  
(from IBM and other companies) are already available on 3½" diskettes. And software makers are working to get new releases out quickly.

## Optical allusion.

If a 3½" diskette can store large amounts of information, here's a way to store gargantuan amounts.

We're introducing a 200-million-byte optical disk drive.

It works with all Personal System/2 computers and, with advanced laser technology, will let you build a massive library of infor-



*The IBM 3363 Optical Disk Drive with "write-once, read-many" disks (left) and the IBM 3.5 Inch External Diskette Drive (right).*



*The IBM 5.25 Inch External Diskette Drive.*

mation for business, science and education on removable disks you can hold in your hand.



# The solution is part of the system.

## The new solutions.

We sell computer systems, but that's not what you're really after.

You want the things a system can do for you.

So while we were busy developing new machinery, we were also active on the software front.

One of the first things we looked at was how you choose software.

Over the last five years, thousands of programs have been written—by us and by others—for IBM PCs. That's a

independent software companies.

## Getting with the program.

We're telling them about our move to 3½" diskettes so they can convert popular programs to that size. We're showing them our new graphics so they can revise software to take advantage of them. And we're keeping them up-to-date about the new IBM Operating System/2

so they can create brand new programs with even higher levels of function.



*IBM CADherite Design and Drafting System SolutionPac for designers and engineers.*

good thing, and we want to keep it going, so we've continued to work with

So, popular programs like Lotus 1-2-3™, WordPerfect® and dBase III PLUS™ will be available for the Personal System/2.





**f the** Needless to say, we've also updated our popular IBM software. IBM DisplayWrite™ 4, the IBM Assistant Series™, IBM Business Adviser\* and IBM educational programs are ready to go for the Personal System/2.

### The IBM SolutionPac™

Then we looked at software from another point of view.

With so many decisions to make, so many combinations of hardware and

designed for your kind of business, with a hardware ensemble that's been matched to it, and tested. Plus a program of service, training and support.

A wide range of IBM SolutionPacs is in the works. Among the first ones available are the Business Adviser Financial Accounting SolutionPac, a

CADwrite Design and Drafting System for designers and engineers, a desktop publishing SolutionPac and a Doctor's Office Management package, as well as SolutionPacs for contractors and lawyers.



*Popular programs will be available for the IBM Personal System/2.*



*IBM Business Adviser Financial Accounting SolutionPac.* software, choosing the right one can be confusing. Maybe you'd prefer "one-stop shopping."

So we created an idea called IBM SolutionPacs.

You'll be able to buy them from selected IBM Authorized Advanced Products Dealers.

What you'll get is a software package



They will make buying easier, and should shorten the time between "I've got my computer system" and "I've mastered my computer system."

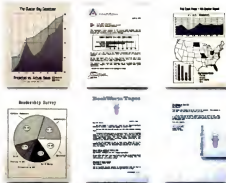
Of course, a big role is played by the new Advanced Products Dealers. Their new "whole-solution" training will make it easier for the two of you to assemble the best system for you.



# New power to the print

## The new printers.

Most of what shows up on your computer screen is seen by just one person. You.



But what comes out of your printer goes out to the world. So it has to look professional, and getting it done has to be easy; virtues that have made IBM personal printers best-sellers.

The IBM Proprinter™ and the IBM Quietwriter® Printer have earned high marks from both customers and critics.

Now our printers are even better, and we've added



*The IBM Proprinter X24 with optional sheet feed.*

new members to the existing family.

## The IBM Proprinter II.

What made the original Proprinter so popular was speed, versatility and convenience.



*The IBM Proprinter II.*

So what do you get more of in the Proprinter II? Speed, versatility and convenience.

There's now Fastfont™, an extra-fast draft mode. Switching to "near letter quality" is faster too, because now there's a button for changing modes.

There's also a choice of typestyles, and of course you can still load envelopes from the front and put in single sheets any time you want.

The IBM Proprinter II is for anyone who wants to print text and graphics, with a printer that's fast and economical.

## The IBM Proprinter X24 and Proprinter XL24.

The IBM Proprinter X24 and Proprinter XL24 are new. The "24"



*The IBM Proprinter XL24 has a wide carriage, ideal for spreadsheets.*



# ted page.

stands for 24-wire technology. What *that* stands for is new levels of Proprinter quality for everything you put on paper.

Both models print letter quality text with greater detail and graphics with better density and definition. The improvement is easy to see.

So is the performance. When compared to current, best-selling, comparably priced 24-wire printers, the Proprinter X24 and Proprinter XL24 print 1½ to 2 times the draft output in the same amount of time.\*

The Proprinter XL24 has a wide carriage for spreadsheet printing, and both have an optional sheet feed for added paper-handling convenience, plus FontSet,™ an option that lets you choose from 11 other typestyles.

## The IBM Quietwriter III Printer.

Earlier IBM Quietwriter printers have always been

easy on the ears, but the new IBM Quietwriter III Printer is even quieter and goes nearly twice as fast, printing executive letter quality text and graphics in an executive hurry.

There's new flexibility in style, as well. The Quietwriter III Printer comes with four different type fonts built in and you can combine typestyles within the same document.

If that's not enough, there are optional font cartridges that give you the freedom to use up to eight typestyles on one page.

There's also a new dual-drawer sheet feed (with optional envelope feed) that lets you use letterhead stationery for the first page of a letter, then plain paper for the rest.

No matter what level of price or performance you need, there's an IBM personal printer to fit the bill. And they fit very nicely with the IBM Personal System/2.



*The IBM Quietwriter III Printer with single-drawer sheet feed.*



*There's also an innovative multiple-drawer sheet feed.*



# It's not just what you buy but where you buy it.

## **The new support.**

As we designed the IBM Personal System/2, we weren't just thinking about products. We also paid serious attention to how, and where, you buy them.

The IBM Personal System/2 offers so many possibilities, so many new ways to do things better, astute guidance must be there if you need it.

So we're raising the bar for customer support. Naturally, our IBM Marketing Representatives are fully knowledgeable about the Personal System/2. But also, we're bringing even greater levels of support from our dealers to you.

## **IBM Authorized Advanced Products Dealers.**

Announcing the new IBM Authorized Advanced Products Dealers.

Selected from our already outstanding dealers, they're being specially trained and qualified. They will have the IBM Personal System/2 computers, IBM network and connectivity products, peripherals, new IBM Operating System/2 when it's available, and all the support you should need.

Perhaps even more important, they'll have a new focus; on systems instead of single pieces of hardware, on solutions instead of circuitry.

They'll be thinking not only about the system you buy, but also about how you'll be using it.

They'll offer help with learning about systems and software, connectivity, and Operating System/2.

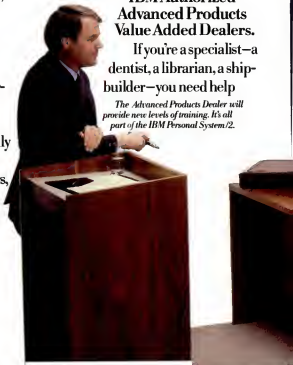
And they're committed to new standards of training for their sales, technical support, and service people.

No matter how big your business, whether you need one computer or a whole network's worth, the Advanced Products Dealer has what you need.

## **IBM Authorized Advanced Products Value Added Dealers.**

If you're a specialist—a dentist, a librarian, a shipbuilder—you need help

*The Advanced Products Dealer will provide new levels of training. It's all part of the IBM Personal System/2.*





uy,

from a special kind of dealer.

Introducing the new IBM Authorized Advanced Products Value Added Dealers.

They're specialists, too. They build enhanced systems for specific industries and now, with the entire Personal System/2 family, their building blocks are better than ever. There's an Advanced Value Added Dealer who understands your business almost as well as you do.

### **IBM Authorized Dealers and Value Added Dealers.**

Our IBM Authorized Dealers and Value Added Dealers will have the IBM Personal System/2 Model 30 and peripherals to go with it, plus special know-how for helping people get started in computing.

### **IBM Marketing Representatives.**

These people have special skills for

helping large companies and educational institutions make the most of their investment in the IBM Personal System/2.

And now, through the IBM Customer Fulfillment Option, our customers may also work with our dealers and value added dealers to get the best of both worlds; additional support for the Personal System/2 plus the benefits of dealing with IBM directly.

### **Congratulations are in order.**

It's not easy to qualify (and stay qualified) as an Advanced Products Dealer. Our expectations are high, as high as yours are.

So when you visit one of our Advanced Products Dealers, give them a nice pat on the back. They've just signed up for a tough course.





# A system that's bigger sum of its parts.

## A new direction.

The IBM Personal System/2 arrives in the wake of some fairly eager public speculation. So we expect there'll be a focus on "the new IBM PCs."

But our focus is different.



*IBM's one-million-bit memory chip joins the world of personal computing.*

While the machines are certainly key to the system, they are not The System.

It's bigger.

And it begins, not with chips or circuit boards, but with you. After all, if our products don't answer your needs, you don't need them.

So everything about the Personal System/2—how we build it, how you learn and use it, where you go to buy it, and how well it works with your other systems—is balanced to give you the highest overall performance.

## A new quality.

We're making the Personal System/2 even more reliable than our earlier PCs.

With new Very Large Scale Integration technology, many pieces in a system are now replaced by one piece. Our one-million-bit memory chip reduces complexity, too. So costs go down, dependability goes up, and you get more work done in less time.

We're also using more IBM-made components, and we're subjecting our systems to more rigorous testing.

We even operate each one for several hours before it goes out the door.

Yet in creating all this new technology, we didn't forget that three million earlier IBM PCs are out in the world. So our two generations are close relatives, and your investment in equipment and training is protected.

Nor did we forget that many of you have larger IBM systems. The Personal System/2 will help you build better connections with IBM mid-range and main-frame computers.

## New help.

We've also made the Personal System/2 easier to learn. New IBM manuals, tutorial



# than the

diskettes, and start-up procedures will help you get your system going quickly.

So will the people you bought it from. Our new Advanced Products Dealers and IBM Marketing Representatives won't just sell you the right system, they'll be there to help you get the most out of it. And as your needs grow, they'll be able to help you expand your system to meet new challenges.

## A continuing tradition.

It's said in the world of computing that the only constant is change, but that's not entirely true.

In IBM's world of computing one thing holds firm, and it's the notion of partnership between our people and our customers. The Personal System/2

is a product of that partnership.

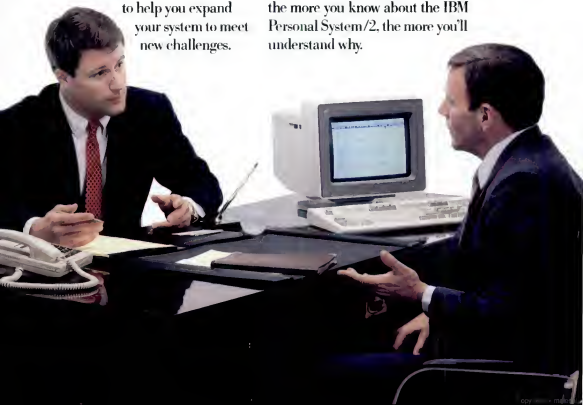
IBM people are some of the best listeners in the business, and when they hear what you

want, they do something about it.

We're very proud of them all, and the more you know about the IBM Personal System/2, the more you'll understand why.



*Earlier IBM PCs and the new IBM Personal System/2 work together so your investment is protected.*





# And now for the fine print.

All models include integrated display support, 256-color graphics capability, clock/calendar, and ports for serial, parallel and pointing devices. All systems use a common IBM enhanced keyboard and accept any IBM Personal System/2 monochrome or color display. All models accept the 200MB IBM 3363 Optical Disk Drive option.

	Model 30	Model 50	Model 60	Model 80
<b>Microprocessor</b>	8086	80286	80286	80386
<b>Potential system throughput<sup>1</sup></b>	Up to 2½ times PC XT	Up to 2 times Personal Computer AT	Up to 2 times Personal Computer AT	Up to 3½ times Personal Computer AT
<b>Standard Memory</b>	640KB	1MB	1MB	Up to 2MB
<b>Expandable to</b>		7MB	15MB	16MB
<b>Diskette size and capacity</b>	3.5 inch 720KB	3.5 inch 1.44MB	3.5 inch 1.44MB	3.5 inch 1.44MB
<b>Fixed disk<sup>2</sup></b>	20MB	20MB	44, 70MB	44, 70, 115MB
<b>Additional Options</b>			44, 70, 115MB	44, 70, 115MB
<b>Maximum configuration<sup>3</sup></b>	20MB	20MB	185MB	230MB
<b>Expansion slots<sup>4</sup></b>	3	3	7	7
<b>Operating system(s)</b>	PC DOS 3.3	PC DOS 3.3 and Operating System/2	PC DOS 3.3 and Operating System/2	PC DOS 3.3 and Operating System/2

<sup>1</sup> Based on the testing described in the IBM Personal System/2 Performance Guide. Your results may vary. <sup>2</sup> Model 30 also comes in a diskette-based configuration. <sup>3</sup> Models with 44MB fixed disk expandable to 88MB. <sup>4</sup> Model 30 accepts most IBM PC and IBM PC XT option cards. Models 50, 60 and 80 accept new IBM Micro Channel option cards.

Now that you've read all about the new IBM Personal System/2 and examined its specifications, what should you do?



Go to your telephone. Call 1-800-447-4700 (ext. 9) and you'll learn who's the IBM dealer nearest you.

(In Alaska call 1-800-447-0890, in Canada 1-800-465-6600.)

And here are two things to ask when

you finally get face to face.

Ask about an IBM Credit Card. It just makes buying that much easier for a person or a business.



Or, if you prefer leasing, ask an IBM authorized dealer or IBM Marketing Representative about the IBM leasing programs.

With those formalities out of the way, you'll want to join the next generation in personal computing. The IBM Personal System/2. **IBM**

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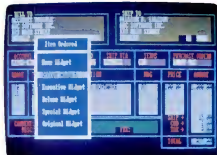
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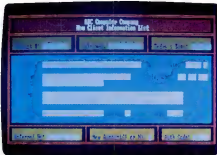
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■ JOHN C. DVORAK

# ORIGINS OF THE WORD "NERD"



*Most computer users bandy about the term "computer nerd" without regard for its origin. But not our man Dvorak; he had to know where the term came from.*

My quest began years ago. My goal: to find the origin of the word "nerd." Don't ask me why I was so fascinated with this thankless chore. I simply had to know.

Surely this popular word wasn't derived from "nerds," as some dictionaries suggest. And it couldn't be a condensed version of the archaic phrase "ne'er-do-well," as some lexicologists surmised.

To find the origin, I asked my readers. One (and only one) discovered it. But first, here are some of the other reports I received.

Like many others, Jack McCarty of Washington, D.C., believed it was somehow derived from Mortimer Snerd. Snerd was a famous dummy used by ventriloquist Edgar Bergen from the late 1930s until around 1970. This same theory was forwarded by Ricardo Alfaro of San Jose, California, who also remembers Jerry Lewis being called a nerd in one of his early movies.

**ENGINEERS AND SURFERS** Creative origins turned into folklore are popular with everyone, including professors who enjoy, and seemingly believe, a ludicrous tale of the word "knurd." This seems especially true at M.I.T. in past years. Gordon Schnaper of DuPont heard this version at Rensselaer Polytechnic Institute: "The word was originally spelled 'knurd,' which is 'drunk' spelled backward. It meant a guy who studied all the time, got all A's, and never took part in parties or activities. He was always sober, hence the inverse of drunk." Nice try. This story

was very popular on campuses in the early 1970s.

Meanwhile, I can't tell you how many librarians sent me the same page from the *Second Barnhart Dictionary of New English*. In it the editors say: "1965. Originally hot rod and surfing slang, probably an alteration of earlier slang (1940s) 'nert' meaning stupid or crazy person, itself an alteration of 'nut.' Also spelled 'nurd.'"

The "nurd" spelling is used by those who feel the word is obviously derived from combining the vulgar term "turd" with "nut" to get "nurd."

The idea that the word had to change to avoid liability is found in a memo from Gary Schwartz of Berkeley, California, who believed that, on its way to becoming "nerd," the word "nuts" had to become "nerds" because it was considered "a bit risqué to use the word 'nuts' on the airwaves in the 1930s."

Acronyms are popular explanations for

the origin of the word. Arthur Zatarain, of Louisiana, claims the word was originally "gnerd" and was an acronym for "gross, nervous, evasive, repulsive and disgusting." Craig Patchett of Greenwich, Connecticut, figured it was an acronym for "Neurotic Engineers in R&D."

You get the idea.

**ZOOLOGICAL ORIGINS** The problem with all these explanations of the origin of the word is that they are stupid and/or only go back to 1960 when the word seemingly appeared out of nowhere. Enter Ed Clark of Boulder, Colorado. He remembered his childhood days and came up with what seems to be the true and logical origin of the word "nerd." It was a creation of Dr. Seuss in his 1950 book *If I Ran the Zoo* (Random House). It's spelled properly and the character drawn is... what can I say—a nerd! Theodor S. Geisel (aka Dr. Seuss), 83, told me that he never heard the word before he drew that character. In fact he'd forgotten all about his little nerd character. "Perhaps it comes from 'Nerdfoegel,' which I'm sure you know all about," says Geisel without explanation.

I figure the monosyllabic word "nerd" crept into the subconscious of the prelate postwar baby boomers sometime in the 1960s.

Now to find the origin of the word "twerp."



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■ JOHN C. DVORAK

# INSIDE TRACK

*Comdex Japan starts to click. Will 2-inch disks replace film? Will the eyeball replace the mouse?*

Japan Comdex looks like it's turning into an **important show** after all. While, in the past, the trade show had little of interest to offer, returnees from this year's extravaganza report **hot stuff** galore.

The diminutive 2-inch floppy was all over the place. If you haven't heard of it don't fret—yet. A couple of years ago, Maxell invented a 2-inch floppy that looks like a 3½-incher only smaller. It was designed to hold a megabyte of data. Maxell introduced it hoping some hardware blokes would make a drive to accommodate the little fellow.

Sony accommodated. It showed a 2-inch drive at Comdex. Not only that, but Sony had a prototype **black box** that somehow stored **64 full-frame images** on one 2-inch floppy. I didn't get the specifics of the box, but apparently there's something going on in Japan similar to the RCA work I discussed last issue. And that is: cutting down on the number of bits needed to store images. But this time it's for another reason: to replace film altogether as a medium for image capture. And I don't mean motion picture film being supplanted by minicams (that's a done deal). I mean **2-inch diskettes replacing 35mm film** in handheld snapshot cameras. That's exactly what **Nikon** was showing at Comdex. It took 16 snapshots and put them on a 2-inch disk.

Think about the system of the future. You take some snapshots. Put the 2-inch disk in your computer and laser print a copy of the "photo" or manipulate it with a paint program. You'll never have to buy film again. Forget about time-consuming developing.

Of course, the quality of these images is another issue. At best, we can expect

VCR-quality images, which is approximately 256 by 200 pixels by 64,000 colors. It's the number of colors that makes the image come alive, not the resolution. Full color is a number just over 16 million. Compare this VCR image to the theoretical pixel resolution of Ektachrome 35mm slide film: 4,500 by 3,000 pixels by 16 million colors. That's what I'm told by the company. We've got a way to go to achieve that kind of clarity, so don't start selling your shares of film manufacturing stock just yet.

**Other hot stuff.** Seiko had a laptop with a built-in scanner. That seems like a peculiar idea, but part of a trend to integrate scanning, photocopying, fax, etc. Surely they don't expect to start a new business called **laptop publishing?** I can see a new magazine already. The machine called the SX-200 will sell for less than \$1,000.

Seiko was also promoting an advanced thermal printer. Apparently some of the company people thought not only that the device can compete with a laser printer, but that it can **"kill laser."** I don't think so.

Many were buzzing about the new fax standard being developed in Japan and the buzzword is "personal fax."

Finally, one company showed some fancy glasses that monitor your eye movement and eye focus so accurately that you can not only position a cursor by looking at a spot, but **position the cursor in three dimensions.** The military has already tested this technology for fighter pilot targeting. Called the Eye-Mark recorder, it comes from a company by the name of NAC.

**Save the Day Dept.:** If you're finding strange bugs in mini modems that fit into laptops, it's probably because the Sierra

two-chip modem set has some peculiar bugs that nobody, it seems, except **Holmes Microsystems** has fixed. This is the chip set that goes into nearly every mini or pocket modem. On top of the fix the Holmes modem uses less power, has a super signal-to-noise ratio sensitivity, and puts zero (0.0 finger equivalency) load on the phone. I'd say that the Holmes plug-in modem for the Zenith Z-181, the Toshiba T1100/T3100, and the IBM PC Convertible are the **best out there and they're shipping them now.** I plugged one into my Z-181 and it works great. **Highly recommended.** Call the company at (801)-572-6865 or write Holmes Microsystems, 7050 Union Park Center, #610, Midvale, UT 84047. They cost from \$295 to \$339.

**Genuinely Interesting Software Dept.:** Two for Lotus users. (I try to please everyone with this column.) Do you want to teach someone the ins and outs of a spreadsheet? Want to teach them Lotus or Lotus clone techniques? The most creative approach I've seen (and winner of the Dvorak Great Name for a Software Product Award) is the **Templates of Doom.** It's an adventure game/satire written in the Lotus "language." It runs on Lotus and most of the Lotus clones (call number below for details). Excellent product for \$49.95. Available through Solar Systems Software, 8105 Shelter Creek, San Bruno, CA 94066; (415) 952-2375. Recommended.

For the expert Lotus user, let's go buy a copy of **Macropac's 101 Macro's for Lotus 1-2-3.** This is one hot product. Another \$49.95 winner, this product adds shortcuts, pop-up calculators, keystroke speedup tricks, and a ton of features. Everyone who owns this package raves about it. If you use Lotus, then you should buy this. Contact Macropac International, 19855 Steven Creek Blvd., #168, Cupertino, CA 95014; (408) 996-8143. Hot stuff.





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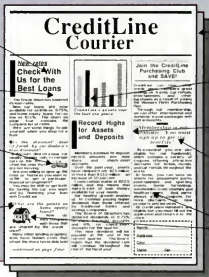
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■ JIM SEYMOUR

# THE CURSE OF THAMUS



*Lured by the attraction of getting our work done faster, we've let our computers do our remembering for us. How much will we forget?*

In the *Phaedrus*, Socrates tells of the Greek god Thoth's invention of writing and its skeptical reception by Thamus, King of Egypt. Full of himself, Thoth urges Thamus to spread writing throughout his kingdom.

Less than impressed, Thamus strikes a cautionary note: "Those who acquire writing will cease to exercise their memory and become forgetful; they will rely on writing to bring things to their remembrance by external signs instead of on their own internal resources."

To mix my historical allusions, Thamus's words were at once Luddite and also wise. The use of many kinds of new inventions can dull the senses, diminish our reliance upon our native intelligence, and lead us to surrender previously held knowledge.

A little skeptical, are you? Ask anyone who's recently gotten a new telephone with an auto-dialer or who uses a program that provides auto-dialing of a built-in database: it's amazing how fast all those numbers, once so easily recalled, slip into the ether when we replace a quick memory scan and manual dialing with pushing a button or a key.

**INNOCENT LOSS** The Curse of Thamus lies heavily upon the heads of many who have embraced PCs. Often the loss is innocent enough and more than balanced by the rewards of the new tool. Clearly, using a well-designed and helpful software program to look up and dial telephone numbers leads to forgetting once-easily-remembered numbers; yet the gain in speed

and convenience of "spinning" a computerized Rolodex and tapping a couple of keys far outweighs the loss of forgetting colleagues' numbers.

But the greater and less-evident effects of surrendering to a computer appear when we are confronted with a familiar task but find ourselves without our familiar tool. Or when we find ourselves trying the 10th or 20th program of a kind. Then we wonder if maybe it wouldn't have been simpler to do the job without the computer in the first place.

Seymour Papert, known equally well for creating *Logo* and for making outrageous statements with a ring of truth to them, loves to remind people that just because we can do something on a computer doesn't mean we ought to. I know whereof he speaks.

In my office, there is a running joke about The Boss's endless willingness to believe that every new auto-dialing PC-

Rolodex program will live up to expectations. I have—forgive me; treasured, over-worked, and underpaid employees have—over the years pounded major sections of our few-thousand-names database of addresses and phone numbers into countless Rolodex-style program files.

There was a *dBASE II* file that never worked right, a *PFS:File* file that took forever to search, a *SideKick* file no one liked, an HP *Executive Card Manager* file everyone liked but that wouldn't pop up, a *Traveling SideKick* file that pooped out somewhere around 325 names, and a few others too tedious or too painful to recall. I think there was even one from the Rolodex company itself.

We never did find one we liked.

**BACK TO PAPER** We finally decided to build a conventional *R:base* database and print *paper* telephone directories for everyone, planning also to use it to write comma-delimited files of names and phone numbers to feed to new Rolodex/auto-dialer programs.

The wisdom of that approach was confirmed when I got a prerelease copy of *Hot Line* a few months ago.

I'm tired of waiting for the ultimate name-and-addressbook program, which also auto-dials. The time involved in setting up a real database, with a real database program, and in defining reports is well worth it. Then let it build a separate file for your auto-dialer—which, of course, assumes your new auto-dialing program is set up to accept files from external sources.

*Hot Line*, thank God, is. And based on





## ■ JIM SEYMOUR

the early returns—but remember I've called this one wrong a dozen times before—*Hot Line* is going to become the program of choice around here.

*Hot Line* is the best-designed, fastest,

easiest-to-use auto-dialing program I've seen. It pops up without the usual conflicts of resident programs; it zips through either a built-in 2,000-name directory of businesses or your own 60,000-entry tele-

phone list; and it makes the connection.

About that fast.

Alas, the people who developed *Hot Line* weren't users of Sprint or MCI or another of the alternative long-distance services. So they didn't build-in a means of auto-dialing the necessary prefixes for non-AT&T long-distance services. (There are a couple of clumsy work-arounds, neither of which is likely to be employed by many real-world PC users.)

But that will be fixed in the next release, they tell me.

**ATTRACTIVE ALTERNATIVE** So I am left to ponder whether we really need pop-up auto-dialing or whether our now frayed but priceless *R:base* printouts will continue to serve. I am seduced—truly and deeply and powerfully, as a consenting

■ The less-evident effects of surrendering to a computer appear when we are confronted with a familiar task but find ourselves without our familiar tool.

adult—by the ease of hitting Alt-F10 instead of rifling through that damned bound printout.

Seductive? Yes, absolutely. But necessary?

And I notice that I no longer remember very well even commonly used telephone numbers. Especially when I'm sitting in a hotel room away from the office, auto-dialer, and printout.

At those times I sometimes hear a faint Greek chorus over my shoulder: "Those who acquire auto-dialers will cease to exercise their memory and become forgetful; they will rely on computers to bring things to their remembrance by keystrokes instead of on their own internal resources."

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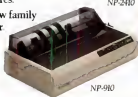
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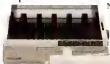
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CIRCLE 251 ON READER SERVICE CARD



■ STEPHEN MANES

# NO MORE DUCKS! NO MORE PIES!



*Take one statistical survey, an overhead projector and a graphic presentation and what have you got? Nap time? Worse, it's probably Chartjunk.*

If given the right to banish a single device from the face of the earth, I might well nominate the overhead projector, doubtless the single greatest cause of boredom, alienation, and anomie in these United States. The mere sound of rustling transparencies has been proven to induce sleep in over 90 percent of adults.

The overhead projector institutionalized the "presentation"—the dull recitation of duller material by even duller humanoids in suits. At least the blackboard requires occasional personal intervention. With transparencies, the humorless drone of the "presenter" usually reiterates what's on the screen, for a total information density slightly lower than old Burma-Shave signs.

Technology marches on. Now the bore-masters can use a PC and TV to perform all the functions of an overhead projector—and more. Gosh, you can even animate your presentation! Now you'll really grab your audience—and lasso a passel of cash!

No, you won't. The utter lameness of every animated presentation I've seen isn't solely a result of the limits of the equipment, though the current state of the art is admittedly pre-Flintstone. It's primarily a people problem, the result of the same lack of imagination that brought you Sandman the Salesman and his Soporific Spiel. You've seen it hundreds of times, even if you've never seen it before: *Your Sales Will SKYROCKET* (rocket ship blasts off the screen); *Your Profits Will ZOOM* (dollar sign soars into the stratosphere); *YOU and Zoot Computers: Partners in SUC-*

*CESS* (dumb cartoon human shakes hands with dumb cartoon computer); and . . . oh, it's too depressing to go on.

The bane of all this has got to be "business graphics," whose operative idea seems to be that pictures will keep people awake when words won't. Wrongo: most people have seen so many pie charts by now that the glaze-over eye reflex appears faster in response to graphs than to virtually anything else. The reasons are simple: the facts are boring and the graphics stink.

The single most powerful gust of fresh air on this subject is a book that has very little to say specifically about computers, isn't brand new (Copyright 1983), and isn't available except directly from the publisher. It's \$34 postpaid, the only way to get it is to send a check or money order to Graphics Press, P.O. Box 430, Cheshire, CT 06410, and it's called *The Visual Display of Quantitative Information*.

That dry-as-a-thesis title is the worst

thing about Edward Tufte's book. This beautifully typeset, illustrated, and printed large-format volume is an accurate, opinionated, funny, and downright rude short course in the history and practice of graphics. It should be mandatory reading for anyone permitted to turn on a plotter or to press /G from Lotus.

**GRAPHIC BEGINNINGS** Surprisingly, the production of graphs has a rather short history. Some of the earliest are still the best: the one that appears in the book's ads, Charles Joseph Minard's marvelous 1861 historical graph-map, shows at a glance the size, location, and decimation of Napoleon's army as it attacked and retreated from Russia, along with the temperature (cold). Tufte says, "It may well be the best statistical graph ever drawn," though I personally favor Minard's brilliant graph of the global French wine trade, in which you can almost get tipsy from the claret and burgundy flowing around the world.

But Tufte devotes plenty of space to the "worsts." The chapter on "Graphical Integrity" displays a hilarious bar graph whose unmarked baseline surreptitiously begins at minus \$4,200,000, thereby making a mild annual loss look like a stupendous profit. Tufte's "Lie Factor"—defined as the ratio between the size of the effect shown in the graphic and the size of the effect shown in the data—produces a barrage of grim examples employing dubious area, volume, and perspective devices, culminating in a *Time* magazine inset on oil price increases that overstates reality by a whopping 5,940 percent.





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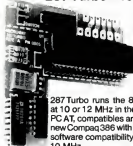
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## ■ STEPHEN MANES

"Chartjunk" is Tufte's term for a variety of superfluous gewgaws (including elaborate cross-hatching and coloring) that some designers consider "artistic" but in fact make the graph harder to fathom. In honor of the Long Island architectural milestone, "The Big Duck," whose "whole structure is itself decoration," Tufte bestows the sobriquet "duck" upon graphics whose "overall design purveys Graphical Style rather than quantitative information." Can you hear this magazine's 3-D graphic extravaganzas gently quacking?

In the process of demolition, Tufte constructs some rules of his own. "The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data," he states, and proceeds to show how the judicious use of an eraser can turn bars into lines, eliminate unnecessary gridmarks, and make range extremes more useful, all to the benefit of clarity. Tufte explains why tables are often preferable to graphs and states matter-of-factly that "given their low data-density and failure to order numbers along a visual dimension, pie charts should never be used." An equally unequivocal reference to the subject is cited to wean Simple Simons from their incorrigible pie-loving ways.

Tufte offers suggestions about the integration of words and graphs, and points out how gray scales can often be far more unequivocal than color at displaying information. He bewails the typesetting exigencies that have too often relegated graphics to second-banana status (for example, "See Fig. 17, following page"), instead of the seamlessly integrated text and figures seen in such places as the Leonardo manuscript reproduced in the book—making one wonder if here lay the inspiration for Xerox's "Leonardo" ads for desktop publishing packages designed to help remedy this very problem.

**THE WRONG NUMBERS** This is a work of the best sort of skepticism. It opens with a three-page suite demonstrating the value of map graphics—and then dissects many of the dubious assumptions that underlie it. Later, Tufte points out the bitter truth of business graphics: "If the statistics are boring, then you've got the wrong numbers. Finding the right num-

bers requires as much specialized skill—statistical skill—and hard work as creating a beautiful design. . . ."

In the introduction, Tufte hopes "that the book has consequences for the viewers

and makers of those images—that they will never view or create statistical graphics the same way again." Maybe so. It might even "wake up America" from its overhead-projected siesta. □

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# WHY IBM IS GETTING BASHED



*No one gives IBM much of a chance to regain the lead it once had in setting PC standards. IBM's traditions will prevent that from happening.*

IBM-bashing has become very fashionable these days. A few days before writing this, I moderated what was billed as The Battle of the Pundits, a meeting marking the tenth anniversary of The Boston Computer Society. The pundits involved, aside from myself, were Jim Seymour and John Dvorak, co-columnists for *PC Magazine*, plus Jerry Pournelle, the *Byte* magazine and *Infoworld* columnist, and Michelle Preston, microcomputer analyst for Salomon Brothers on Wall Street.

You would think that a group like this could find lots to disagree about. I came to the meeting planning to stir things up with a prediction that, during the next 3 years, Apple Computer would end up with a bigger share of the business market than would IBM itself (not including the PC-compatible manufacturers). That, it seemed to me, would be a suitably outrageous prediction, guaranteed to generate plenty of debate. Indeed, I was banking on such disagreement to provide entertainment for the Society's members.

It didn't. In fact, everybody on the panel of pundits basically ended up agreeing that IBM would be a minor player in the personal computer market of the future. Preston opined that Tandy would end up owning the so-called PC compatible market. Seymour actually agreed that Apple had a shot at overcoming IBM. (Dvorak and Pournelle just grimaced.)

How did we get into such a situation? IBM, after all, has been the scourge of many a wishful computer company, as time after time it has demonstrated an uncanny ability to perceive the market's

needs and fulfill those needs. And here we have a group of widely read pundits actually agreeing that IBM didn't have much of a future in the PC business and may well lose the whole war to a bunch of flakes from California that work for a company named after a fruit!

**CHANGING TIMES** What happened is that the computer business has changed in a way that IBM doesn't seem to understand. That change was caused by personal computers. For more than 30 years, IBM had operated in a business in which certain officials within a company bought computer products—mainframes plus communications and storage devices—that either the whole company or a major part of it used in one fashion or another. This meant that the people from IBM maintained personal relationships with the people from the company that bought and maintained the products, and both parties knew what

they were talking about. The IBM reps understood computers and the customer reps understood computers. Everything was very cozy and mutually supportive.

Even when minicomputers came along in the mid-sixties and Digital Equipment Corp. was able to make major gains, IBM didn't suffer as badly as it is suffering now. That's because the minicomputer business, while it changed some of the competitive factors in the computer industry, didn't change the fundamentals. Computers were still bought from representatives of the vendor by people who understood what they were buying. The purchases were still relatively expensive. The only difference was that IBM was a little slow in understanding that smaller parts of big companies could justify minicomputers and arrange their purchase and installation.

But personal computers have fundamentally altered the relationship between vendor and customer company for two reasons. First, individuals now benefit in a personal way from the purchase of personal computers. That means that everybody wants in on the act, whether to specify and buy their own equipment or at least to have some influence over their company's purchases. Nobody, in other words, wants to get stuck with a PC or software that they can't or don't want to use. Second, everybody now knows how computers operate. It used to be that the data-processing professionals could befuddle anyone that challenged their planning, simply by tossing around a few phrases like core memory and system efficiency. Now any self-respecting executive knows that every com-





## ■ STEWART ALSOP

puter has a processor, operating system, memory, storage, display, input, and output. And they're not about to let the MIS guys get away with bigger budgets just because they speak more mumbo jumbo.

As a result, even though it looks as though the MIS department or information center or microcomputer manager is in charge of specifying and acquiring computer equipment, the fact is that the execu-

tives and individual users now influence those purchases in a dramatically more active way than even 5 or 6 years ago.

**WHAT WENT RIGHT?** All this begs the question that if IBM hasn't understood the change in the computer business, why was it successful in establishing the standard PC architecture in the first place and in developing what has become a \$5 billion business over the last 5 years? To answer that, you have to recall the unusual way IBM got into the PC business in the first place. Back in 1981, the chairman of IBM sent a group of 12 talented people down to Boca Raton, Florida, and said to them, in essence, "Make and sell a personal computer without worrying about anything else that we do as a company or about how we do it."

That's exactly what Phillip Estridge and his crew did. They designed a PC according to the precepts of the PC industry, not according to IBM's precepts. And that PC turned out to be exactly what people were looking for from IBM.

Ever since then, though, IBM has been pulling the PC back into its normal channels and traditional ways of designing products.

The company is now stuck with a tremendous problem: Design machines for the individual users who determine the success of every new personal computer that comes along and, in so doing, continue to violate the precepts of the company at a time when it's being accused of maintaining multiple, incompatible systems across its product line.

Or design a new system that fits smoothly into the company's systems-wide architecture but that doesn't really appeal to those ever-powerful individual users.

By the time you see this column, if the industry rumormongers are right about IBM's product introduction schedule, you will have the answer to how IBM will react to this dilemma. Unfortunately, if my pundit panelists and a good portion of the industry are right, IBM will have chosen the latter path and essentially abandoned the PC business to companies that don't have mainframes and minicomputers to worry about, companies like Apple, Tandy, Compaq, and even PC's Limited.

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Vincent Puglia PC Magazine Vol. 6 #3

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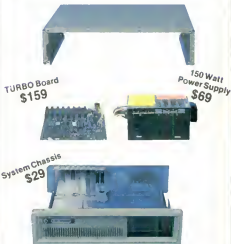
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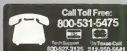
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# EQUIPPING YOUR NETWORK:

## THE LANSTATION ALTERNATIVE

**A**s a piece of office furniture, the PC is a total flop. It takes up too much space and seldom matches the surrounding decor. Nor is it a success in the ergonomics department. Its fan generates heat and its hard disk drives

make distracting sounds.

And if that PC is on a network, it's a safe bet your data isn't secure. Unless you maintain a complex set of passwords on a series of segregated disk drives, directo-

ries, and subdirectories, anyone with access to the network can copy data onto a local disk and take it out the door.

The need for smaller, quieter machines with cooler power supplies, improved security, and lower cost has spawned a new kind of information system appliance: the diskless workstation.

### THE DISKLESS WORKSTATION

Don't confuse a diskless workstation with a mini or mainframe computer terminal. Terminals execute a program running under a multitasking operating system in a shared processor using shared memory. If one program heavily loads the processor or memory, the performance of all programs

running on the system can suffer.

A diskless workstation is a desktop system with no local disk drives. It reads DOS and all working files from the hard disk of a shared server. Because it has its own CPU, a diskless workstation could even be rebooted without affecting any other station.

Two distinct types of diskless workstations have entered the marketplace: the LANstation and the clustered-CPU terminal. Each has unique attributes, but they share the advantages of reduced space, reduced cost, and improved security. They also share the disadvantage of having a central point of failure for an entire office or work group.

*Compact, quiet, and cool, LANstations might be coveted by any PC user. Built without disk drives, their forte is securing data on local area networks. Here we review six LANstation systems.*



## ■ LANSTATIONS

**LANSTATIONS** The LANstation operates through traditional media-sharing local area networks like 3Com Corp.'s Ethernet, AT&T Information Systems' StarLAN, or Standard Microsystems Corp.'s ARCnet. It contains a CPU, RAM, and video interface as well as a network adapter card, and uses the network server for all permanent storage. The LANstation draws DOS and all the program and data files from the server over the network, but executes them in the local CPU and RAM of the LANstation.

Most LANstations have a full complement of parallel and serial ports built into the main circuit board. As a result, you can attach printers and modems to the LANstation, and access shared devices attached to the server through the network.

**CLUSTERED CPU** The clustered-CPU system changes the geometry of a local network by separating the CPU, RAM, and video adapter from the keyboard and display. Circuit boards, each containing all the elements of a PC except the keyboard and display, are clustered together in a single cabinet with a common power supply and disk drives. Thin cables are run to low-cost displays and keyboards located hundreds of feet away from their processors. Each operator has the dedicated resources of a complete PC, often including a megabyte or more of RAM, but the overall size and cost of the systems sitting on the desk are substantially reduced.

The clustered-CPU workstations normally have a limited number of local connection ports available. Usually, you can attach locally only one parallel or serial device to a workstation. Greater emphasis is placed on sharing printers, modems, and other peripherals through the server.

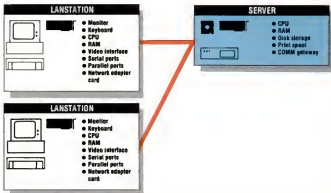
**PROS AND CONS** The advantages of the LANstation over the clustered-CPU workstation are related to the network environment. You can mix 256 or more PCs and LANstations on sophisticated networks, along with multiple servers. And you can extend traditional LANs to cover thousands of feet. Mainframes and minis often come with devices to directly interconnect them with networks such as the IBM Token-Ring Network and 3Com's Ethernet.



### LANstation Architecture (Coaxial cable or twisted-pair LAN media)

Containing no local disk drives, LANstations must operate through a traditional media-sharing LAN. The LANstation itself contains a processor, RAM, and video interface as well as a network adapter card. The network server runs the networking software and is used for all permanent storage. The

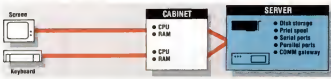
LANstation stores DOS and all program and data files on the server but executes them in its local CPU and RAM. Because the LANstation also has serial and parallel ports built into the circuit board, you can attach printers and modems to it.



### Clustered-CPU Architecture (RS-232C cable)

The clustered-CPU system changes the geometry of a local area network by separating the CPU, RAM, and video adapter from the keyboard and display. Circuit boards, each containing all the elements of a PC except the keyboard and display, are clustered together in a single cabinet with a

common power supply and disk drives. Thin RS-232C cables that can be hundreds of feet long run from the displays and keyboards to the processors. With this method you share printers, modems, and other peripherals through the server.



You can also link a clustered-CPU system with other workstations and larger computers, but making that connection is more difficult and complex than with a traditional LAN. Clustered CPUs are generally better suited to the needs of smaller work groups within a 200 foot radius. Be-

cause clustered-CPU systems use inexpensive terminals, their ability to produce color or graphics may be limited—something that does not affect LANstations. Clustered-CPU systems are also silent, while most LANstations (3Com's is the notable exception) still include small fans.





## LANstations: Summary of Features

(Products listed in ascending price order of configuration tested)

	Kimtron Satellite Diskless PC/Intelli- gion Workstation Kimtron Corp.	Corvus Diskless PC Workstation Corvus Systems Inc.	Racore PC AT- Compatible Diskless Workstation Racore Computer Products Inc.	3Com 3Station 3Com Corp.	NCR 3390 Workstation NCR Corp.	Pure Data LANmark Network Workstation Pure Data Ltd.
<b>Base price</b>	\$699	\$1,095	\$1,260	\$1,895	\$1,832	\$2,995
<b>BASE PRICE INCLUDES</b>						
RAM	256K	256K	512K	1 Mbyte	512K	2 Mbytes
Clock/calendar	●	○	○	●	●	○
Monitor	●	○	○	○	○	○
Ports	1 serial, 1 parallel	None	1 serial, 1 parallel	2 serial, 1 parallel	2 serial, 1 parallel	1 serial, 1 parallel
Total no. of slots	3	3	2	0	1	2
No. of slots free	2	2*	0	0	0	0 or 1†
Power supply (watts)	71	55	73	25	50	65
Reset key	○	○	○	○	○	○
Keyboard style	Original AT	Improved PC	Standard PC	Enhanced AT	Standard PC	Standard PC
Microprocessor	NEC V40	8088	80286	80286	80286	80186
Fax	●	●	●	○	●	●
Other	Built-in Hercules- and CGA-compatible mono/graphics card, keyboard	Omninet network interface card, keyboard	None	Built-in EtherLink card, EGA display card, keyboard	Built-in Hercules- and CGA-compatible monographics card	Combination ARCnet network interface/EGA card, keyboard
<b>CONFIGURATION TESTED</b>						
Price	\$1,453	\$2,210	\$2,262	\$2,595	\$3,211	\$4,639
Includes	All features of base model, EtherLink card, monochrome monitor	All features of base model except Omnet card, EtherLink card, Hercules-compatible mono/graphics card, serial port†, monochrome monitor including parallel port	All features of base model, EtherLink card, monochrome monitor, monochrome video cards	All features of base model, EGA monitor‡	All features of base model, EtherLink card, color monitor	All features of base model except ARCnet card, serial and parallel ports, EtherLink card, EGA monitor‡, EGA display adapter card‡
<b>SPECIFICATIONS</b>						
Clock speed (MHz)	6 and 5.5	4.77	12.5 and 10	8	10 and 8	8
Dimensions (HWD in inches)	4 × 18 × 15	3½ × 15 × 14½	2¼ × 14½ × 15	3 × 14 × 14	2.75 × 11 × 15.3	2¼ × 18½ × 15
Uses any LAN card	●	●	○	○	●	●
Uses any video card	○	●	●	○	●	●
<b>MISCELLANEOUS</b>						
Warranty	90 days, parts and labor	180 days, parts and labor	6 months, parts and labor	1 year, parts and labor	90 days, parts and labor	1 year, parts and labor
BOS manufacturer	Kimtron Corp.	Corvus Systems Inc.	Racore Computer Products Inc.	Phoenix	NCR Corp.	Pure Data Ltd.

●—Indicates Editor's Choice. ○—Yes. —No.

\*Requires use of additional slot for serial and parallel ports.

†Pure Data markets a combined ARCnet interface and EGA video controller card that leaves one slot in the workstation free.

‡No serial port provided by Corvus. We added \$100 for the average price of a serial port.

§Monitor not provided by 3Com. We added \$700 as the average price of an EGA monitor.

|| Monitor not provided by Pure Data. We added \$700 as the average price of an EGA monitor.

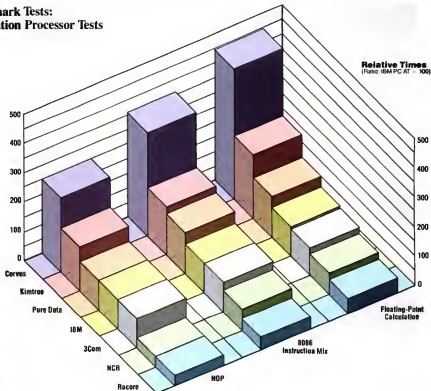
¶Pure Data sells EGA card only in combination with network interface card. We added \$349 for the average price of this product.

\*\*Slots in Corvus machine are very narrow. We were able to insert 3Com's EtherLink card but can't guarantee that all other cards will fit.





## Benchmark Tests: LANstation Processor Tests



### Performance Times (Times given in seconds)

Product	Processor (Speed)	NOP	8086 Instruction Mix	Floating-Point Calculation
Curves Diskless PC Workstation	NEC V20 (4.77 MHz)	10	32	160
Kimbro Satellite Diskless PC-Intelligent Workstation	NEC V40 (5.5 MHz)	6	15	78
Pure Data LANmark Network Workstation	80186 (6 MHz)	4	13	50
IBM PC AT (8 MHz)	80286 (8 MHz)	4	9	36
3Com 3Station	80286 (8 MHz)	4	9	34
NCR 3390 Workstation	80286 (10 MHz)	3	7	28
Racore PC AT-Compatible Diskless Workstation	80286 (12.5 MHz)	3	4	18

Performance on the processor tests is directly related to the efficiency and speed of the workstation's processor and data handling capabilities. You can see this clearly in the performance of the 12.5-MHz Racore machine. On the other hand, the slow times posted for the Curves system directly reflect its slower processor speed. It is interesting to note that in several tests the performance of the 80186 processor in the Pure Data workstation was the equal of other machines using the 80286 processor.

We evaluated the LANstations both for their performance as standalone computers and for their performance on the network. We evaluated the LANstation processors as stand-alone computers using the PC Labs processor tests. The benchmark tests were loaded from the server but executed in the CPU of each workstation.

The NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big "for" loop.

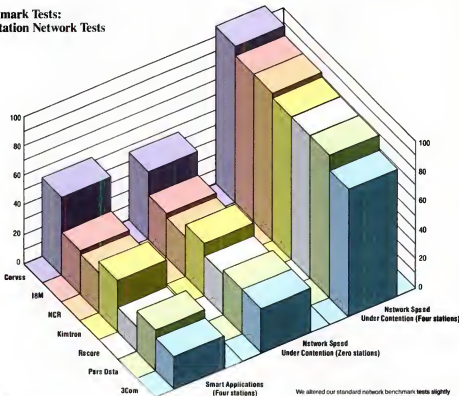
The 8086 Instruction Mix benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 8086 instruction code. These instructions are a subset of the total processor instruction set.

The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.





## Benchmark Tests: LANstation Network Tests



### Performance Times (Times given in seconds)

Product	Processor (8speed)	Smart Applications (Four stations)	Network Speed Under Contention (Zero stations)	Network Speed Under Contention (Four stations)
Curves Diskless PC Workstation	NEC V20 (4.77 MHz)	53	46	106
IBM PC AT (8 MHz)	80286 (8 MHz)	30	30	100
NCR 3390 Workstation	80286 (10 MHz)	28	28	100
Kimtron Satellite Diskless PC/Intelligent Workstation	NEC V40 (5.5 MHz)	35	36	98
Rescare PC AT-Compatible Diskless Workstation	80286 (12.5 MHz)	17	27	97
Pure Data LANmark Network Workstation	80186 (8 MHz)	28	30	95
3Com 3Station	80286 (8 MHz)	22	30	87

In this set of network tests, the 3Com 3Station performed particularly well on the four-station Smart Applications and Network Speed Under Contention tests because it addresses the network cards directly.

We altered our standard network benchmark tests slightly because we wanted to test the LANstation's performance rather than that of the network.

We used the following equipment configuration for the network: one LANstation, one IBM PC AT, two IBM PCs, one PC-XT, 3Com's 3Station, 3Com networking cards in all the stations, and 3Com's 3 + Share networking software. For comparison, we show results for an IBM PC AT substituted for the LANstation.

The Smart Applications series of integrated network programs from Innovative Software allowed us to run a limited DBMS exercise. The Smart Applications benchmark test is a good general measure of performance because it requires the LANstation to call for data through the network and execute the Smart DBMS program locally.

The Network Speed Under Contention benchmark test with zero stations measures the time it takes for the LANstation to draw files from the server under conditions of no network load and move them to other subdirectories on the server's hard disk. Although this test is affected by the speed of the server's hard disk, the effect is held constant for all the workstations tested when the same server is used in all the tests, as is the case here with our testing of four stations.

Here we run the Network Speed Under Contention benchmark test under busy network conditions with the four other stations contending for network access. The test is performed using batch files that call files from the server's hard disk cache and deposit them to null. Stations with good I/O efficiency between the network interface card and the data bus perform well on this test.



## ■ LANSTATIONS

**INSTALLATION** LANstations come with differing degrees of expandability. For instance, the Kimtron Satellite Diskless PC/Intelligent Workstation has three open PC-type expansion slots. You must use one of these slots for the network interface card of your choice, but the others can hold expansion cards for a mouse or for memory expansion beyond the 640K bytes available on the motherboard. On the other hand, conflicts over direct memory access (DMA) and interrupt channels, memory addresses, and other expansion-related problems can still exist.

LANstations like 3Com's 3Station and shared-CPU systems come prepackaged and ready to run. There are no options, switches, or conflicts. While you may or may not like this "appliance" approach, at least the market gives you the alternative.

**COST** Because costs vary so widely, you won't find that diskless workstations have any hard-and-fast economic advantages over standard PCs. The prices of hard disk drives and network interface cards are dropping precipitously. In January 1987, a hard disk cost several hundred dollars less than a network interface card. While a 200-megabyte hard disk with a controller typically costs about \$400, network interface cards average about \$600. With this balance, the most economical solution is to give every user a local dedicated hard disk. But by mid-1987, network interface cards are expected to drop to around \$200 and continue falling. At that price, the cost ratio favors sharing hard disk systems through a network. The inexpensive network interface card, being pioneered by Western Digital and a few other companies, makes the diskless LANstation economically viable.

Theoretically, clustered-CPU systems cost even less on a per-station basis than LANstations. Clustered systems have lower wiring costs and share power supplies and peripherals very economically. Currently, however, the price differential between these types of diskless systems is small.

**PERFORMANCE** Many users of networks report that they get faster response times from the hard disk of the server than from their PCs' local hard disk drive. This

## BOOTING UP REMOTELY

Setting up a network station to boot from the server is not a difficult job, but it requires that you install hardware and software carefully.

Many network companies sell remote boot PROM chips for their network adapter cards for use with a specific network operating system. The cards are normally equipped with an empty socket to accept the PROM.

We chose the 3Com EtherLink cards for this project because they are the most widely used cards in PC-based networks. 3Com provides PROMs for these boards to be used with its 3+Share network operating system. Novell also sells PROMs for these same 3Com cards for use with its *Advanced NetWare*.

When a workstation has a remote-boot card in place of an internal disk drive, it must find and boot from the so-called DOS image on the server's hard disk. With 3Com's 3+Share you use an optional program called 3Start to create a DOS image for diskless workstations. With Novell's *NetWare*, the installation program allows the creation of a DOS image.

The speed at which a workstation boots from the network depends primarily on how busy the server's hard disk

drive is. Under lightly loaded conditions, the boot sequence is about as fast or faster than it would be from the local hard disk drive of an XT. When the server's disk is busy, booting the first station from the server can take longer than booting from a local floppy disk. But subsequent stations booting from the server benefit from the fact that the server's RAM caches the start sequence.

**MEMORY CONFLICTS** Installing a remote-boot card into a PC or PC AT-style machine can cause memory conflicts among devices in the workstation. The boot PROM must be mapped into an appropriate place in memory where the ROM BIOS can find it. Because the memory maps of PC and PC AT-type systems are so different, the card may have to be addressed differently for each kind of system. As an additional complication, devices like the Enhanced Graphics Adapter do not always use the same locations, sometimes using portions of the memory that overlay the boot PROM. We suggest that you try to set a boot PROM into a location like D1000H, but be ready to create and study a memory map of your system if you experience problems.—Frank J. Derfler, Jr.

is particularly true when the workstation has an XT-type disk drive and the server has a fast-access disk drive with plenty of RAM buffering.

Our benchmark-test results show that while the effects of network loading and the types of jobs being done are important, the two types of diskless workstations usually can receive responses as fast or faster through shared resources than through locally attached disk drives.

**VULNERABILITY** One warning must be included in any evaluation of diskless systems. If all workstations boot off of one shared disk drive, then one blown fuse or faulty disk drive can put the entire network out of service. However, when you use standard PCs as workstations, when the server goes down, people can normally do

some work on local disk drives.

You should, therefore, strongly consider getting an uninterruptible power supply for the shared part of these systems. Using more than one hard disk drive in a server and more than one server in a system is also a good idea. Unfortunately, these measures also push the cost of diskless systems back up again.

**DISKLESS WHIRL** Many network managers will find LANstations an economical and effective way to expand existing networks. Shared-CPU systems are especially cost-effective for introducing automation into a work group or as a wholesale replacement for PCs in an office. In this issue we will benchmark-test and review six LANstations. In the next issue we will look at clustered-CPU alternatives.



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## ■ LANSTATIONS



CORVUS SYSTEMS INC.

### Corvus Diskless PC Workstation

Corvus Systems chose a high-flexibility, low-cost, and moderate-performance mix for its diskless PC Workstation. The unit holds five slots and offers IBM PC-level performance, all in a 15-inch-wide, 14½-inch deep, and 3½-inch-high box. Corvus markets this workstation as part of a product line that includes networking cards and servers. But to maintain consistency in our testing, we tested the station with 3Com's 3+Share and EtherLink cards. It worked just fine.

The Corvus Diskless PC Workstation is essentially a motherboard with a processor, RAM, and a card cage for add-on boards. Although Corvus's motherboard holds an 8088-type processor from NEC (the V20) instead of from Intel, it has 640K bytes of RAM, and the unit is more compact, the similarities between the Corvus Diskless PC and the standard PC are substantial.

The unit has five full-length, but very narrow, PC-type card slots for any configuration of I/O, network interface, and graphics cards you want.

The front panel of the Corvus Diskless PC was obviously designed to allow you to

insert one 3½-inch disk drive, though adding an internal drive reduces some of the expansion slots to half-length-card size.

The keyboard supplied with the Corvus Diskless PC is XT style with some oversized keys and indicator lights to show the status of the Lock keys.

**INSTALLATION** The very narrow slots on the Corvus Diskless PC presented a challenge when we tried to install 3Com's

EtherLink card. Because the EtherLink coaxial connector on the back of the card needs the space of a full panel, it took some careful alignment and a little coaxing to get it in right. (Corvus doesn't have this problem with the adapter cards for its network because it uses a small, twisted-pair wire connection.) Other cards with large or multiple connectors might have similar problems.

Otherwise, installing cards for I/O ports

*At 15 inches wide by 14½ inches deep by 3½ inches high, the Corvus Diskless PC Workstation is essentially a motherboard with a NEC V20 processor and 640K bytes of RAM. It also has five full-length, narrow, PC-type card slots for any configuration of I/O, network interface, and graphics cards you want.*



#### FACT FILE

##### Corvus Diskless PC Workstation

Corvus Systems Inc.  
160 Great Oaks Blvd.  
San Jose, CA 95119  
(408) 281-4100

**List Prices:** \$1,095, including 256K RAM, keyboard, Omninet network interface card, five expansion slots. Monitor, \$225; Hercules-compatible monochrome graphics card, \$195. Network Workstation, with all of the above, \$1,315.

**In Short:** The Corvus Diskless PC Workstation is essentially a motherboard with a processor, 640K bytes of RAM, and a five-slot cage for add-on boards. This approach gives you flexibility in choosing whatever I/O, video, network adapter, and any other boards you wish. Its performance is on par with other 8088-based machines.

CIRCLE 876 ON READER SERVICE CARD



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CIRCLE 517 ON READER SERVICE CARD

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## 132 Character Display.

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- View 65% more data on screen than Hercules or IBM
- 8 x 14 character cell (over twice the character resolution previously available on any 132 character mode)

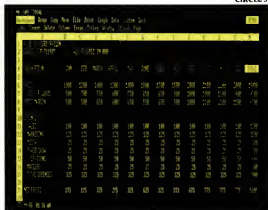
## High Resolution

### Monochrome Graphics.

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## More Space for Windows.

- 1056 x 352 bit mapped resolution
- Almost 50% more than Hercules Graphics Card



ACTUAL SCREEN showing all 12 months and the totals column of a Lotus spreadsheet at one time. Note the sharpness of the 8 x 14 character cell produced by STB's Chauffeur HT.

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- Display full reports on screen
- Crisp 8 x 14 character cell

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## Full I/O Capabilities.

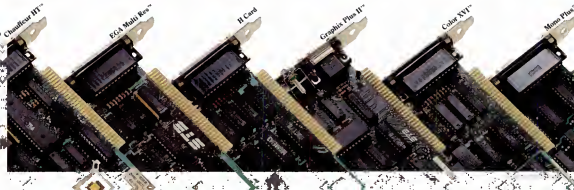
- Standard parallel printer port
- Optional clock/calendar
- Optional serial port

## PC Accelerator™ Software.

## STB Two-Year Warranty.

## IBM PC/XT/AT Compatible.

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and video means selecting and inserting the cards. You will, however, find it difficult to install boards with tall components or with additions such as cable connectors without losing a slot. As with the IBM PC system, you select memory and video options using a DIP switch on the motherboard.

You should be aware that the workstation draws air for cooling through slots on both sides of the unit. It could be electronically disastrous to block those slots by putting the machine too close to a wall or shelf.

**OPERATION** The Corvus Diskless PC performed like a typical PC in our benchmark tests. The processor tests reported times consistent with those of other machines with an 8088 processor and a 4.77-MHz clock speed. The LAN benchmark tests showed that the speed of the processor isn't everything. Rather, the results of the LAN benchmark tests depend on the amount of processing that occurs in the workstation and how much the time relies on other components of the network. For instance, the Smart Applications test uses the processor more; the Network Speed Under Contention tests rely more on the server.

**ERGONOMICS** The machine stands about an inch taller than most of the other diskless workstations we reviewed, but its other dimensions are about the same. We couldn't find any ratings on the power supply, but we estimate it to be about 65 to 75 watts. A small fan moves air in from the sides and out the back of the cabinet. It doesn't make much noise, but in this case it makes us wonder about the cooling available in this five-slot system.

The best thing about this system from the ergonomic viewpoint is the fact that both the keyboard and the on/off switch conveniently are located on the front panel. Making the on/off switch easily accessible is such a simple thing to do, but too few companies do it.

**FLEXIBILITY** The Corvus Diskless PC Workstation gives a network manager a flexible set of configuration alternatives. This machine would be a good choice in installations in which no local printer or se-

rial ports are needed, since you don't have to pay for anything you don't use. It would also be a contender for installations requiring different kinds of I/O devices such as a bar code reader, scanner, or mouse. It isn't fancy, but sometimes simple functionality is all you need.

## KIMTRON CORP.

### Kimtron Satellite Diskless PC/Intelligent Workstation

The Kimtron Satellite Diskless PC/Intelligent Workstation is a well-designed product that offers the low-cost and ergonomic advantages of a diskless workstation while providing some of the flexibility of a standalone PC.

Kimtron Corp.'s Satellite measures 16 inches wide by 4 inches high by 15 inches deep. It includes three expansion slots for standard PC (8-bit) expansion cards. Since I/O ports, RAM, and the video controller come on the motherboard, the slots are free for the network interface card and two other cards, such as a mouse or extended memory. The unit houses a 71-watt power supply and fan.

The baseline Satellite system has 256K bytes of RAM (expandable to 640K bytes), a NEC V40 processor running at either 8 or 5.5 MHz, and both a serial and a parallel port. A socket is available for the addition of a PD 72191 math coprocessor. The on-board clock has a battery backup.

The Satellite's built-in video adapter emulates both the Hercules monochrome/graphics and IBM Color/Graphics adapters. A mono/color switch on the back of the cabinet lets you select between the two modes. The color/graphics adapter includes a light-pen connection. Kimtron supplies either monochrome or color/graphics monitors for the Satellite.

The unit comes with an 84-key keyboard with a PC AT-style layout. The keyboard has a soft touch and lights that indicate the status of the Lock keys.

**INSTALLATION** You can configure the Satellite several different ways. You can select color or monochrome video, various levels of memory, and any network card

available for PC-style machines. Although you must set one internal bank of switches to indicate the various memory and video alternatives, this is a less difficult job on the Satellite than it is on a standard PC. You should be aware, however, that there is the potential for DMA (direct memory access) and interrupt conflicts among expansion boards in the Satellite, so take care when adding boards to the system.

**ERGONOMICS** The small size of the system unit is its strongest ergonomic feature. It fits unobtrusively under the monitor, or you can place it out of sight on the floor or on a shelf. But because the AC power switch is located on the right side of the back panel, you'll need to maintain an access path to the back of the unit or switch the power on some other way. The power supply includes a fan that is smaller and quieter than the standard PC's fan.

The Kimtron keyboard is the same size as the PC AT's, and the monochrome monitor has a tilt/swivel base.

**PERFORMANCE** Our benchmark tests show that the Kimtron Satellite is significantly faster than a standard PC; however,



## FACT FILE

### Kimtron Satellite Diskless PC/Intelligent

#### Workstation

Kimtron Corp.

1709 Junction Ct., Bldg. 380

San Jose, CA 95112-1090

(800) 828-8899

(408) 436-6550

**List Prices:** \$699, including 256K RAM, keyboard, built-in video adapter with Hercules monochrome/graphics and CGA compatibility, one serial port, one parallel port, three full-size expansion slots, NEC V40 8-MHz processor, math coprocessor socket. With KM-1 monochrome monitor, K-NET LAN, \$995; with amber monochrome monitor, \$848; with green monochrome monitor, \$858; with color monitor, \$1,198; with K-NET LAN, \$1,088.

**In Short:** This system offers cost and size advantages over a standalone PC, as well as some of the PC's expandability. The compromises are a size that's slightly larger than some diskless stations, increased complexity of installation, and a noisier fan.

CIRCLE #24 ON READER SERVICE CARD



it isn't quite as fast as an 8-MHz PC AT. The Satellite might take a second or two longer to execute a large database search than a system equipped with an 80286 running at 8 MHz, but the server's hard disk drive could be responsible for much greater differences in execution time.

**SERVICE** The Kimtron Satellite can be serviced nationwide by ITT Servcom. This organization has technicians specially

trained on the Satellite hardware. Additionally, Kimtron has a telephone-based customer support service.

**HIGH-LOW MIX** The Kimtron system is aimed at giving high performance at a low price. The three expansion slots available in this machine give it flexibility, but they increase the size of the machine and the complexity of installation, and mean that the unit requires a noisier fan. The

*The Kimtron Satellite Diskless PC/Intelligent Workstation—at 16 by 15 by 4 inches—offers the ergonomic advantages of a diskless workstation and the flexibility of a PC. Since I/O ports, RAM, and the video controller are on the motherboard, its expansion slots are free for the network interface card and two others.*



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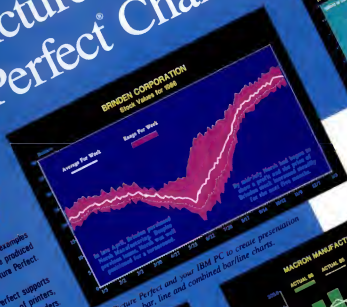
Dozens of optional, high-resolution typefaces can be shared by Picture Perfect and Diagraph.

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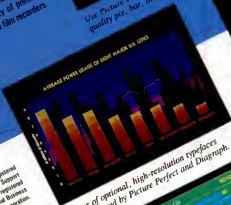
**Computer Support Corporation**  
2215 Midway Road  
Carrollton, TX 75006  
(214) 661-8960



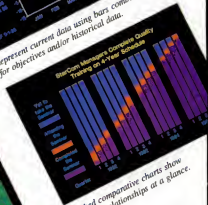
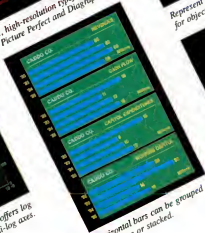
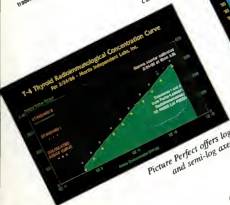
Use Picture Perfect and your IBM PC to create presentation quality pie, bar, line and combined bar/line charts.



Load data from any of the popular spreadsheet and database products.



Represent current data using bars combined with lines for objectives and/or historical data.





## ■ LANSTATIONS

Kimtron Satellite is a good choice for LAN installations using interface cards not available "on the motherboard" or for which special interfaces are needed.

### NCR CORP.

#### NCR 3390 Workstation

The design of any LANstation is based on trade-offs between flexibility and size. The smallest machines usually integrate everything onto one system circuit board and leave no room for expansion slots. Machines with the flexibility gained from having many expansion slots can lose their size and cost appeal. The NCR 3390 Workstation is one of the smallest units that still gives you some choice of network interface cards. It costs \$1,832, not including the network adapter card.

NCR Corp.'s 3390 Workstation is about the same volume as the 3Com 3Station and has the same PC AT-level processing power. It is 11 inches wide, 2.75 inches high, and 15.3 inches deep. However, while the 3Station has empty space added to ensure proper support for a monitor, the 3390 Workstation's cabinet is fully packed. This packaging gives you several

choices, such as adding an internal 3½-inch floppy disk drive or even an internal 20-megabyte hard disk. In fact, with an added hard disk, the little 3390 Workstation could become a good network server for five or six workstations.

NCR's engineers have used surface-mounting techniques to produce high-density circuit boards. A combined CPU and video card with an 80286 processor and 512K bytes of RAM occupies one PC AT-type expansion slot. The processor's speed is selectable between 6 and 10 MHz. A separate configuration board holds two

DIP switches that control the video display in use, RAM configuration, and other alternatives. The board also contains an RS-232C serial port (with a standard 25-pin connector) and a serial printer port.

The 3390 Workstation has enough room and power to allow you to install an optional 3½-inch fixed or floppy disk drive. NCR's 3½-inch 20-megabyte hard disk drive has an access time of 65 milliseconds, which is about the same as that of an older IBM PC XT. NCR markets an external cabinet with its own power supply that allows you to add other, larger floppy

*The NCR 3390 Workstation uses surface-mounting techniques that produce high-density circuit boards. The 11- by 15½- by 2½-inch cabinet has 2 AT-type expansion slots. A combined CPU and video card with an 80286 and 512K RAM occupies one; the other is for the network interface card.*



### FACT FILE

#### NCR 3390 Workstation

NCR Corp.  
Personal Computer Division  
1700 S. Patterson Blvd.  
Dayton, OH 45479  
(513) 445-5000

**List Prices:** \$1,832, including 512K RAM, built-in video adapter with CGA and Hercules monochrome/graphics compatibility, two serial ports, one parallel port. Keyboard, \$125; color monitor, \$659; 2-Mbyte upgrade, \$995; external 3½-inch disk drive, \$360; mounting options, \$70. Unit with built-in video adapter with EGA compatibility, \$2,110.

**In Short:** A compact system that still gives you a choice of networking cards. You can also add a 3½-inch floppy disk drive or an internal hard disk. The processor can run at 6 or 10 MHz, and performance is on a par with other machines running at those speeds. With its speed and memory capacity, this little station can even act as a network server.

CIRCLE 67 ON READER SERVICE CARD





## ■ LANSTATIONS

and hard disk drives to the system. The external cabinet can also house additional I/O ports. We did not receive the expansion cabinet for review.

The cabinet has one unused PC AT-style expansion slot with a 16-bit-wide data bus interface. You would normally use this slot for the network interface card. Because the unit comes with a 16-bit-wide bus, you can use certain highly efficient network cards, such as the 3Com "Plus" series, with the NCR system. The addition of an efficient network card and hard disk could transform this small workstation into a workhorse server for a small network. It would not work as a server with Novell's *NetWare*, however, because it doesn't have a second expansion slot to hold the key card Novell uses as a copy-protection scheme.

**ERGONOMICS** The power supply in the 3390 Workstation includes a small fan that is nearly silent. The unit emits little heat. All cables attach at the back of the workstation and the keyboard cord must be brought forward, but it can fit into an opening on either side of the cabinet.

The keyboard supplied by NCR with the workstation is sturdy and functional, but plain. It has no light indicators showing the status of special Lock keys; nor does it have special cursor keys.

The AC power switch on the 3390 Workstation is a small sliding bar on the left side of the unit. However, by rotating the cabinet 90 degrees you can decide if the switch should be in the front or on the left side. Either way, you have to keep a path open on the left-hand side of the unit to reach the power switch or to make room for the cables. The system has no power or operational indicators.

NCR also sells brackets that allow you to mount the workstation vertically on a desk or wall. This kind of mounting would certainly tuck it out of the way.

**INSTALLATION** The compact conditions in the 3390 Workstation cabinet make installing a network card or changing configuration switches slightly more difficult than performing similar jobs in a standard PC. The system comes with an AT-style lithium battery and CMOS PROM that holds the system-configuration pa-

rameters set by software. You control the software setup through a self-prompting, easy-to-use menu.

**PERFORMANCE** The performance of the 3390 Workstation on our benchmark tests was consistent with its rated processor speeds. In its slowest speed setting it equals the performance of a standard IBM PC AT. Hitting three keys on the keyboard boosts the processor to 10 MHz. The results of changing processor speed are more apparent on the processor benchmark tests than they are on the LAN benchmark tests, which rely on other factors such as the response time of the server.

**A LITTLE NET** It would be possible to use NCR 3390 Workstations to make a complete local area network system that includes workstations with no disk drives, workstations with 3½-inch floppy disk drives, and workstation/servers with hard disks. We didn't test the 3390 Workstation as a server, but with the right networking software it has the processor speed and memory capacity to act as a server.

**PURE DATA LTD.**

## Pure Data LANmark Network Workstation

It is almost unkind to evaluate the Pure Data LANmark Network Workstation the way we did. Not because it isn't a good product—it performed very well—but because it was designed and built to be compatible with Novell's *NetWare* and the Pure Data ARCnet networking system. Testing the LANmark under the 3Com networking software and EtherLink network interface cards is taking it completely out of its element. However, using the 3Com system provided us with a consistent testing environment, allowing us to make better comparisons.

Pure Data manufactures and markets a line of ARCnet hardware that includes many features, such as operational indicators on the cards and hubs and high engineering specifications. Perhaps its most-innovative product is a combination ARCnet network interface and EGA video system on a single PC expansion card.

- If you use Pure Data's combined EGA and network interface card, you'll have one slot left over for additional I/O or other devices.

This is a useful combination that can save slots in workstations with or without disk drives.

Fully configured, the LANmark costs \$2,995, including network cards. It uses an 80186 processor running at 8 MHz. A socket is available for an 8087 math coprocessor. You can place 1 or 2 megabytes of RAM on the motherboard. The memory over 640K bytes is used with the Lotus/Intel/Microsoft expanded memory specification drivers. The system also provides one RS-232C serial port (with a full-size DB-25) and one parallel printer port.

Two full-length IBM PC expansion slots are available, but they would normally be occupied by a video card and a network interface card. However, if you use Pure Data's combined EGA and network interface card, you'll have one slot left over for additional I/O or other devices.

Although the LANmark does not use surface-mounted components, the board layout is clean. The unit has a 65-watt power supply, and it uses a small fan to pull air in the front of the machine and out the bottom.

The LANmark does not support DMA (direct memory access), so technically it has somewhat limited expansion capabilities—but it has no room for internal disk drives anyway. Some networking software (like 3Com's 3+Share) must be specially configured for systems that do not use DMA.

**INSTALLATION** If you use the LAN-mark as a workstation for an ARCnet LAN, you can just take it out of the carton and plug it in. But even if you do need to



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Technical Reference)
- Complete Burn-In
- Factory Configuration
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## ■ LANSTATIONS

change the cards in the expansion slots, it is a simple job. Cards are mounted horizontally, and you can reach each card independently.

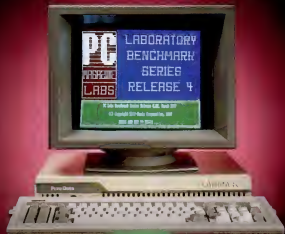
The early-version LANmark we evaluated used a plug-in jumper to make changes in the memory or video configuration, but later versions of the system are supposed to have a DIP switch for these functions.

Pure Data provided the best technical literature and manual that we received with

any of the LANstations. It included the memory maps that can be so important if you run into trouble interfacing the computer with such devices as network adapter cards. The literature contained clear diagrams and was very thorough.

**ERGONOMICS** The LANmark is 16½ inches wide, 2¾ inches high, and 15 inches deep. Although it is one of the widest systems we evaluated, it is still more than 3 inches smaller than a standard IBM PC.

*The Pure Data LANmark Network Workstation measures 16½ by 15 by 2¾ inches. Its two full-length IBM PC expansion slots would normally be occupied by a video card and a network interface card. Using Pure Data's combined EGA/Network interface card, however, frees one slot for other devices.*



The AC power switch is on the back panel of the machine on the far right and is big enough to find easily. The front of the unit holds the keyboard plug and a power indicator light; such little things are important in office environments. Even though the left side of the unit draws in some air, there are enough air slots in the front panel so that you could place the left side against a wall or shelf. The fan makes very little noise.

The keyboard supplied by Pure Data has a standard PC layout with lights for the NumLock and CapsLock keys but with small keytops on the Return, Tab, and other frequently used keys. The keyboard has a soft feel and does not "break" when you press a key.

**OPERATION** The LANmark's 80186 processor just about equaled the performance of the PC AT's 80286 processor in the processor benchmark tests. The machine also performed quite well in the LAN benchmark tests, which are less processor intensive and rely more on I/O capabilities.

The LANmark's expanded memory operates under the Lotus/Intel/Microsoft expanded memory specifications and Pure Data provides the memory driver that the CONFIG.SYS file loads as a device. It also supplies a RAMdisk program that al-



## FACT FILE

### Pure Data LANmark Network

#### Workstation

Pure Data Ltd.  
200 W. Beaver Creek Rd.  
Richmond Hill, Ontario Canada L4B1B4  
(416) 494-9590

List Prices: \$2,995, including 2 Mbytes RAM, keyboard, combination Pure Data ARCnet network interface card/EGA display adapter card, one serial port, one parallel port.

**In Short:** One of the widest systems tested, the Pure Data LANmark Network Workstation is still substantially smaller than a PC. As an ARCnet-type system, it is the standard against which you judge others. But its two slots also provide some flexibility (for instance we tested it with 3Com cards and it performed just fine).

CIRCLE 872 ON READER SERVICE CARD



# In Retirement Memories Abound



## Retire Your PC Coax Connection

The PC-to-host coax connection. She was a good piece of equipment working with coax cable and cluster controllers, but time just passed her by. End users started needing more than simple host access. They also needed their PCs to share resources around the office. That's when local area networks came along to fill the need.

LANs are dramatically increasing office productivity through efficient information management. And Gateways are exploiting LAN versatility by providing cost-effective host communication for PCs and other network devices. Now for thousands of dollars less, LANs and Gateways provide PC-to-PC and PC-to-host communications all without a cluster controller.

INS Gateway PC Adapters are engineered around proven INS SNA 3274 cluster controller emulation. A single INS Gateway PC Adapter in an IBM NETBIOS compatible LAN, including Token Ring, will support up to 32 logical unit sessions. The LAN allows each PC on the network to share disks, printers and other resources while the Gateway allows performance of any host-supported function and maintains host access.

INS planned on PCs becoming a major component in the development of information systems. We designed our Gateways to be the logical choice in providing the vital link between LANs and

mainframes. We also planned on much more—flexibility, simplicity and reliability. We provide free, responsive user assistance and guarantee every INS Gateway PC Adapter (hardware and software) for five years.

Now the vast resources of mainframes and local area networks are available at your fingertips with INS Gateway PC Adapters.

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**INS**  
⚡

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An **ICOT** Company

CIRCLE 128 ON READER SERVICE CARD



## ■ LANSTATIONS

lows the use of fast local RAM as a simulated disk drive. As with any RAMdisk, you have to remember to download files to permanent storage (in this case over the network to the server) before shutting off the workstation.

**A COMPLETE SYSTEM** Pure Data has done an excellent job of packaging an entire system for use as a LANstation. If you want an ARCnet-type system, the LANmark should be the standard you judge all others against. System integrators should like the LANmark because its two slots provide extraordinary flexibility, while its detailed manual and specifications make the job of bringing the pieces of a system together much easier.



**RACORE COMPUTER  
PRODUCTS INC.**

### **Racore PC AT- Compatible Diskless Workstation**

Racore Computer Products markets a line of local area network interface boards and computer systems. Its network interface boards are compatible with the IBM Token-Ring Network and other network systems. The Racore PC AT-Compatible Diskless Workstation comes in two models: an IBM PC-XT compatible and an IBM PC AT compatible.

The AT-Compatible Workstation we evaluated uses an 80286 processor operating at 10 or 12.5 MHz. It comes standard with 512K bytes of RAM, although the system can be equipped with up to 2 megabytes of RAM. The standard configuration runs about \$1,000, not including the cost of monitors, keyboards, or network adapter cards. Two PC-type (8-bit) expansion slots can hold full-length expansion cards, normally the video and network controller cards. Racore offers you a choice of a monochrome, CGA, or EGA video adapter board. (Pure Data markets a combined Pure Data ARCnet and EGA card that you could use to free up a slot in the AT-Compatible Workstation.) Unfortunately, the only I/O provided in the system is a single RS-232C serial port terminating in a 9-pin connector.

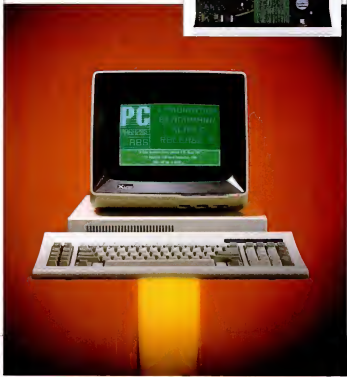
The designers of the AT-Compatible Workstation tried to minimize costs by leaving out some circuits they felt are not normally needed in networked machines. Specifically, they eliminated the real-time clock with battery backup and DMA (direct memory access) channels.

Since the workstation has no clock, the system administrator should include a batch file that gets the correct time and date from the server in the AUTOEXEC.BAT

file. The lack of DMA means that you can't add certain peripherals, such as hard disk drives, to the system.

**ERGONOMICS** The AT-Compatible Workstation is housed in a 14½-inch wide, 2¼-inch high, and 15-inch-deep cabinet that is big enough to support a wide variety of monitors. The keyboard plugs into the back of the unit, but there's no channel underneath or next to the cabinet

*The Racore PC AT-Compatible Diskless Workstation has two full-length, PC-type expansion slots that normally hold the video and network controller cards. Racore offers you a choice of a monochrome, CGA, or EGA video adapter and a PC-style keyboard. The 14½- by 15- by 2¼-inch unit comes with 512K RAM, expandable to 1 megabyte.*





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**■ NETBIOS Support**

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- EasyLAN shares printers, plotters, data, and disk storage
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- New Network Commands
- New NETBIOS
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- Print spooling
- PBX support
- Easy to install
- Easy to operate
- Modem support
- Performs in the background

EasyLAN's low price matches the small business user's cost-sensitive budget. It is the office network solution for less than \$100 per PC.

EasyLAN performs its operations conveniently in the background. EasyLAN communications, file transfers and printer operations all take place while each PC simultaneously performs such normal DOS applications as Lotus 1-2-3™, Wordstar™, and dBASE™.

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Programmers may use EasyLAN to develop network applications using NETBIOS (network file). These applications can now be operated across the low cost RS 232 communications links used by EasyLAN. Our new EasyCALENDAR program is an example of a network application that uses NETBIOS for program to program communications.

Multitask user database management applications that require a high overhead network operating system will perform faster on high cost networks operating at megabit speeds.

## NEW VERSION 3.0 COMMANDS EXPAND NETWORK FLEXIBILITY

EZCLOCK lets PCs attached to the network read the time and date from a single master clock on the central PC, eliminating the need to install individual clock boards in each PC and insuring that all file entries and updates made across the network are dated.

The EZ Make Directory and EZ Remove Directory commands function identically to the DOS MKDIR and RMDIR commands, and give remote users increased flexibility when it comes to managing subdirectories on the central PC.

EZBEEP lets you send an audible signal across the network, alerting a PC user that a file or message is being sent.

## EasyLAN PBX SUPPORT BRINGS NEW FLEXIBILITY TO PC CONNECTIVITY

With EasyLAN's PBX support, users can share peripheral and transfer files using PBX switched circuit connections and existing twisted pair wiring. EasyLAN has already been installed on a number of different PBXs, and recently was certified by Northern Telecom for use on its Meridian SL.

The value is high  —InfoWorld Report Card

Disk sharing uses EasyLAN's EZCOPY command to move files to and from PCs. ASCII or binary files can be transferred in the foreground, or in the background while other DOS programs run.

Printer sharing operates transparently with existing programs. Print files are automatically spooled to disk and scheduled for printing. Multiple printers on the central PC may be designated for individual printing tasks.



EasyLAN Office Network

## EASYLAN SPECIFICATIONS

Each PC in the network requires an individual licensed copy of the EasyLAN program and takes 20k of memory on each satellite PC, a serial port, and DOS 2.0 or above. EasyLAN runs on all IBM PC models and compatibles. The central PC requires a serial port for each satellite PC. The COM2 and COM6 boards are serial port expansion boards which permit you to add serial ports to the central PC.

## EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the EasyLAN cables into existing serial ports. The EasyLAN Network Configuration Program provides menu driven installation program that will guide you step-by-step through the software installation process.

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**TODAY'S NEWS** for broadcasting messages, notices or announcements across the network

**MENU INTERFACE** for easy set up and use

EasyCALENDAR's database for appointments, to do lists and news resides on the central PC. Satellite PCs at each through EasyLAN version 3.0 send network transactions to the central data base to invoke EasyCALENDAR functions.

The EasyCALENDAR calendar program requires EasyLAN version 3.0 and is priced separately.

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Item	Description	Price	Qty	Amount
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EL 03	EasyLAN Expansion Kit—for 1 PC 30' cable, one disk & manual	\$119.95	_____	\$ _____
EL 10	EasyLAN disk & manual (30' disk \$109.95)	\$ 99.95	_____	\$ _____
EL 12	EasyLAN 30' cable	\$ 49.95	_____	\$ _____
EL 13	COM2 serial port expansion board, two ports	\$219.95	_____	\$ _____
EL 14	COM6 serial port expansion board, six ports	\$489.95	_____	\$ _____
EC 01	Easy CALENDAR Kit Supports 6 PCs and 10 people	\$199.95	_____	\$ _____
EL 15	Custom length cables, call for quote			
	CA res. add applicable sales tax			\$ _____
	Shipping charge USA \$10.00, other \$20.00			\$ _____
<b>TOTAL ORDER</b>				<b>\$ _____</b>

CIRCLE 520 ON READER SERVICE CARD



## ■ LANSTATIONS

to permit neat arrangement of the cable. You can put the left side of the unit flush against a wall or shelf.

The 73-watt power supply and electronics require a fan for cooling. Air is pulled in through slots in the front of the cabinet. Although the fan is audible, it is not as loud as a standard PC.

The AC power switch and plug are located on the back of the unit. You have to reach around the back and feel your way past the power plug to get to the switch. There are no power or other indicators of any kind on the unit.

The keyboard provided with the AT Compatible Workstation is PC-style with a moderately crisp feel. It has CapsLock and CaseLock lights and big keys for the Enter, Shift, Ctrl, and Tab keys. The AT-Compatible Workstation is not designed to use IBM PC AT-compatible keyboards.

**INSTALLATION** When installing the system, you have your choice of video cards, the amount of RAM, and whether the single serial port is addressed as COM1 or COM2. Instead of using DIP switches, the AT-Compatible Workstation has six

jumper in various places around the motherboard. You have to remove at least one expansion card and find the right jumper to change the optional parameters.

You install the expansion cards in the workstation horizontally. A separate circuit board and socket make the right-angle connection between the card and the motherboard.

**PERFORMANCE** The technical staff at Racore felt we might have some trouble booting their 12.5-MHz machine from the standard 3Com boot PROM, but it came up without hesitation. The fast processor speed made it fly through our processor benchmark tests at a much faster rate than an 8-MHz AT. It also performed well in the LAN benchmark tests.

Racore's own network is designed to run under Novell's *NetWare*, so we assume that the AT-Compatible Workstation also works well with this network operating system.

**SPEEDY VALUE** The Racore PC AT-Compatible Diskless Workstation offers speedy performance at a reasonable price. The machine's lack of a parallel printer port could be a serious drawback with some applications. We also wish that the power switch were easier to reach. But if you don't need more I/O ports or expansion cards, Racore's system is an economical workstation with high-speed performance.

### 3Com Corp.

## 3Com 3Station

The 3Com 3Station is a WYSIWYG workstation. Almost everything you could want in a workstation is rolled up into one svelte, \$1,895 system that's easy to install and maintain. But it also offers no flexibility since you can't add on to the unit. Nonetheless, the 3Station offers top-flight capabilities and performance.

Measuring 14 inches wide, 14 inches deep, and 3 inches high, the 3Station is the smallest and least imposing of any LANstation we tested. In fact, the designers had to add unused space to the cabinet to make it big enough to hold a wide variety of monitors. The cabinet also has open space



## Inside the 3Com 3Station and the IBM PC AT: Mapping the Functions

The circuit board in the 3Com 3Station diskless workstation provides all the basic functions of an IBM PC AT, plus at least four add-in boards. To understand what the 3Com board does, you can think of it as being divided into roughly five sections. The first section (1) contains the functional equivalent of an IBM PC AT system board (sans expansion slots). This part of the board has an 80286 processor, two application-specific integrated circuits (ASICs) to handle address and data decoding, and 1 megabyte of memory, expandable to 4 megabytes. The memory chips use the new SIM (single in-line module) packaging. The IBM PC AT shown in the photo has just 512K bytes on the system board, so it needs an expansion card like the Intel PS/AT to add additional memory.

The second section (2) of the 3Com board contains the functional equivalent of a Paradise AutoSwitch video adapter. The AutoSwitch emulates a variety of video modes, including IBM monochrome, Hercules monochrome graphics, and IBM CGA and EGA. The video adapter in the AT system is Video-7s VEGA Deluxe, but we could have installed the AutoSwitch or any other video adapter.

The third section (3) of the 3Com board is responsible for input/output functions of the unit. Two of the circuits on this part of the board are a peripheral ASIC and a keyboard controller. To obtain the equivalent of two serial ports and a parallel port on the IBM PC AT, we installed the aforementioned PS/AT and an IBM serial-parallel board.

The fourth section (4) of the 3Com board handles networking. On this section of the board is a networking ASIC and a new chip that was codeveloped by National Semiconductor and 3Com. The latter is capable of multipacket buffering, a feature of 3Com's new EtherLink Plus boards. The AT in the photo is equipped with a full-size EtherLink board for networking.

The fifth section (5) contains the power supply.

Some final observations on the 3Com LANstation: It uses a 25-watt power supply compared with our 200-watt AT supply, and there are no switches to install or set—resident in ROM are menu-driven setup, diagnostic, and boot software.

\*A subset of EtherLink Plus that is newly developed by National Semiconductor Corp. and 3Com Corp.



## FACT FILE

### Racore PC AT-Compatible Diskless Workstation

Racore Computer Products Inc.  
170 Knowles Dr.  
Los Gatos, CA 95030  
(800) 325-1833  
(800) 521-6366 (in Calif.)

**List Prices:** \$1,260 (12.5-MHz version), including 512K RAM, one serial port, one parallel port. Monochrome monitor, \$190; keyboard, \$85; LANpac card Model R102, \$325; LANpac card, Model R104, \$425; monochrome video cards, \$132; additional 512K RAM with 100-nanosecond memory for 10-MHz, \$183; additional 512K RAM with 80-nanosecond memory, \$329; T-connectors, \$13; Terminators, \$3. 10-MHz version, including 512K RAM, \$974; file server Model 8900, \$1,975.

**In Short:** A speedy performer, the Racore PC AT-Compatible Diskless Workstation gives you two slots in which you can install your choice of network and video cards. Its lack of a parallel printer port could be a drawback for some applications.

CIRCLE 671 ON READER SERVICE CARD



Multipacket buffering chip\*

Network ASIC

Peripheral ASIC

Keyboard controller

**3Com 3Station**

**IBM PC AT**

Hard disk

Floppy disk

PEGA1A

**2**  
**Video-7 VEGA Deluxe**

ASIC address decoder

Video ASIC

80286 processor

256K video RAM

ROM BIOS

ASIC data decoder

1 Mbyte RAM,  
expandable to 4 Mbytes

**3**  
**IBM serial/parallel I/O**

**1 3**  
**Intel PS/AT**

**4**  
**3Com EtherLink**



## ■ LANSTATIONS

at the bottom to allow keyboard and mouse cables to pass through to the front neatly (and, we suspect, to improve cooling).

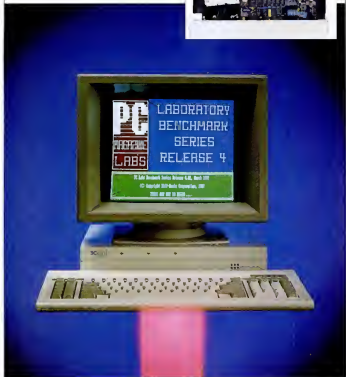
3Com's engineers used very large scale integrated circuits to reduce to a small board and a few chips the functional equivalent of an IBM PC AT with an Enhanced Graphics Adapter, a megabyte or more of memory, a network interface card, a full load of I/O ports, and a mouse adapter.

The heart of the 3Station is an 80286 processor running at 8 MHz. The machine has no expansion bus, so the designers of

the system optimized performance by giving the processor direct access to a 256K-byte display buffer and the Ethernet network interface hardware. On the 3Station, the 3Com networking software resides above the 640K-byte RAM level, so networking does not result in a loss of RAM as it does when other PCs and workstations use the 3Com software.

You do have the option of placing up to 4 megabytes of RAM on the motherboard for use under the Lotus/Intel/Microsoft expanded memory specification and as a

*Measuring a mere 14 by 14 by 3 inches, the 3Com 3Station is the smallest LANstation tested. 3Com's engineers used VLSI chips to reduce to a small board, the functional equivalent of an IBM PC AT with an EGA card, a megabyte or more of memory, a network interface card, a full load of I/O ports, and a mouse adapter.*



## PC MAGAZINE EDITOR'S CHOICE FACT FILE

**3Com 3Station**  
3Com Corp.  
3165 Kifer Rd.  
Santa Clara, CA 95052-8145  
(408) 562-6400

**List Price:** \$1,895, including 1 Mbyte RAM, keyboard, built-in Ethernet adapter, EGA display adapter card, two serial ports, one parallel port.

**In Short:** A compact, swift, and silent machine that comes standard with almost everything you could want in the way of add-ons. However, it leaves little room for customization.

CIRCLE 670 ON READER SERVICE CARD

RAMdisk. This RAM is the only "user serviceable" part of the 3Station. Otherwise, there is no reason to ever get inside the cabinet.

The system has a small 25-watt power supply and no fan. The motherboard comes standard with two serial ports (one with a 9 pin connector and one with a 25-pin connector), a standard parallel port, and an attachment for a Microsoft-compatible mouse device.

The video system provides a monochrome/graphics output using the Hercules

## PC MAGAZINE EDITOR'S CHOICE

### • 3Com 3Station

*The 3Com 3Station, with its full load of I/O ports and memory, good looks, quiet operation, high level of integration, and indicator lights is the clear choice—if you want to use EtherLink network adapter cards. In fact, this product may drive some people to use EtherLink-based networks just so they can have the advantages of the 3Station.*

*If you want to use a network interface card other than the EtherLink, we'd recommend—and we give honorable mention to—the NCR 3390 Workstation for its physical and electrical design.*



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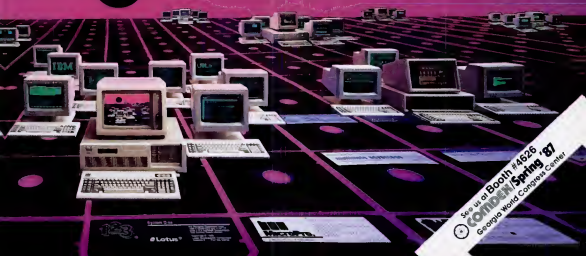
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CIRCLE 36 ON READER SERVICE CARD



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CIRCLE 501 ON READER SERVICE CARD

## ■ LANSTATIONS

standard and full support of the EGA color/graphics outputs.

The Ethernet card built into the system has both thin and thick Ethernet connections. Although you have no choice of network interface cards with the 3Station, you won't have any system interface problems either.

The system comes with a 101-key enhanced-AT-style keyboard, which was unavailable for testing at the time this review was written. We used a standard AT keyboard.

**PERFORMANCE** The 3Station performed faster than an 8-MHz AT on the standard processor tests. But it really shined on the LAN benchmark tests. It was one of the fastest performers on these

■ The 3Com 3Station delivers the maximum operational benefit in a LANstation.

benchmark tests, probably because of its direct addressing of the network cards.

**OPERATING INDICATORS** The 3Station's only moving part is the power switch (except a 110/220 volt selector). It is simple to install and operate—you just plug it in, unless you want to add additional RAM. A nice feature is two lights on the workstation that flicker to show both bus and network activity. This feature gives you a better picture of the status of your workstation and the network than most PCs provide. These lights are particularly useful for troubleshooting a totally silent and swift system like the 3Station.

The 3Com 3Station runs silently and swiftly. It delivers the maximum ergonomic and operational benefit in a LANstation. Although the 3Station gives you no options (except memory), it comes with almost everything you could want. ☐

*Frank J. Derfler, Jr., is a contributing editor of PC Magazine.*





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CIRCLE 244 ON READER SERVICE CARD





Illustration: Tom Savoca





# TAKING *the* STAND

## THE LOOK-AND-FEEL ISSUE EXAMINED

*The Congress shall have Power To . . . promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries; . . .*

*—The Constitution of the United States, Art. I, sec. 8.*

**YOU PROBABLY THINK YOU'RE TOO BUSY GETTING** your job done to consider the look-and-feel issue. Yet the rulings that result may sharply abridge your ability to buy programs you want or to design programs that operate like other programs. In the articles that follow, we present the issues, give you thorough, in-depth information, and tell you what you may be able to do about it.

The look-and-feel issue is based on the premise that the way a product appears on the screen and the way it works are part of the company's copyright. The notion that a company can copyright the look and feel of a product is a radical departure from older precedents that ruled that copyright law should protect only program code.

Court rulings on this issue will be especially relevant in an industry in which progress has been incremental, in which

good ideas are built on others, and in which users rely on formal and informal standards. But creativity should not go unrewarded. Patents and copyrights should cover true inventions, conceptual breakthroughs, and creative expression. Manufacturers have rights, too.

In some instances, it seems as if the industry is its own worst enemy. Apple got the idea for the Macintosh from Xerox's proprietary Star workstation. It then used lawsuits as a fence around the Mac.

●  
*PC Magazine  
steps out of character to  
analyze the look-  
and-feel issue. It's not a  
product review,  
but this topic may affect  
the industry's  
future more than any  
product we'll  
see this year.*



Apple sued Digital Research for infringement with GEM. DRI settled out of court and placated Apple by modifying GEM's icons to look less Mac-like. On the strength of this settlement, without benefit of a legal decision, Microsoft pays a license fee to Apple for Windows' icons, even though they're substantially different from those of the Mac. Is Microsoft protecting itself against litigation, or is it just rolling over and playing dead?

Today the most visible cases are the suits that Lotus Development Corp. has brought against Paperback Software and Mosaic Software for VP-Planner and The Twin. In its suits, Lotus alleges that Paperback and Mosaic infringed on 1-2-3's copyright because they copied exact command names, screen arrangements, and the way the program works.

It's safe to say that most of the public sentiment over Lotus's actions has been more negative than positive. Causing much of the negative feeling is the traditional American reflex to root for the underdog. These tiny companies, the sentiment goes, haven't the resources to withstand the Lotus juggernaut. They do, on the other hand, have the resources to replicate large portions of 1-2-3's interface and function.

There is also a feeling that Lotus should just let bygones be bygones. These products, after all, are compatible with a version of 1-2-3 that isn't being sold anymore and isn't even the most popular version. Release 2 of 1-2-3 outsold Release 1A half a year ago.

**SEE YOU IN COURT** Software developers have a different concern. They ask, "What if Lotus wins this case?" They're not concerned about fines, damages, or the future of Paperback and Mosaic. They're concerned about the suits that will inevitably follow. A judgment in Lotus's favor could cause serious repercussions in the industry if manufacturers move to copyright the function of a program rather than the source code.

Already, the look and feel of a program, quite apart from the source code, has been found to be protected under copyright law. Broderbund Software won a judgment against Unison World, which introduced a PC-compatible version of Bro-

derbund's *The Print Shop* for Apple computers. The judge found Unison had substantially duplicated the look and the feel of the original, thus violating Broderbund's copyright. Indeed, Unison had begun (then broken off) negotiations for developing a PC-compatible version of *The Print Shop* for Broderbund and even had a glimpse at the program's source code and inner workings. The precedent set in this case is probably the most pivotal to Lotus's cases against Mosaic and Paperback.

In practical terms, developers are concerned that if look-and-feel protection is extended to programs such as the PC's BIOS, it could spell the end of compatibles. They are also concerned that the first person or company to come up with a con-

.....  
**Already, the look  
and feel of a program,  
quite apart from its  
source code, has been  
found to be protected  
under copyright law.**  
.....

cept or an appearance owns it against all comers. What is the extent of such coverage? The form factor of a machine? The layout of a screen? A keyboard? A command set? Languages are even more of a concern, since compilers are designed specifically to perform exactly alike. Does that mean that the creators of languages can license the grammar and syntax?

Winn L. Rosch explores these issues and others in "The Copyright Law on Trial." Rosch, a lawyer as well as a computer and electronics expert, takes you through the legal precedents and the relevant cases in progress. The article also lays out the basics of patent and copyright law and defines what each is intended to protect.

My article, entitled "Roots: The Evolution of Innovation," acknowledges that everything is descended from something else. It gives a brief genealogy of some of the major products. The lineage of some may surprise you.

**THE STANDARDS ISSUE** Standards come about in two ways: by agreement and by default. Standards such as the ASCII code, the syntax of COBOL, and the pin-out of RS-232 connectors were all created in committees and adopted by the industry. Standards such as the keyboard layout, use of the F1 key for help, and the size and pin-out of PC expansion cards are de facto standards.

Both kinds of standards help the industry grow by preventing endless reinvention of the wheel. They also ensure a modicum of interchangeability and compatibility. Standards are a critical corporate issue, in which training costs often outweigh software and hardware costs. Jim Seymour explores how look-and-feel cases can affect the development of new standards in "Who Owns the Standards?"

**JUDGE AND JURY** It isn't *PC Magazine's* place to decide the outcome of Lotus's lawsuits, but you should have all the facts at your disposal. The decisions made in these cases will likely have as far-reaching effects on our industry as any in recent memory. Jared Taylor's article, "You Be the Judge," will show you the similarities and differences in the products, so that you can judge the merits of the case for yourself.

An element of gallows humor runs throughout every conversation about this issue. The combatants regularly come up with illogical extremes to illustrate both the pros and cons of the case. Comparisons to the auto industry are rather common. For instance, what if General Motors had copyrighted the look and feel of the location of the gas pedal? Would other manufacturers have to change their cars or "license the technology" from GM? Stephen Manes, in his article, "Who'll Think of Suing What Next?," takes the concept further than you ever thought it could (or should) go.

Also, don't overlook the reader response card in this section of the magazine. It is a survey, asking your opinion and point of view on several aspects of the look-and-feel issue. We're eager to hear your voice be heard, both in future *PC Magazine* editorials and in statistical summaries that we will make available to all interested parties.





# THE COPYRIGHT LAW *on* TRIAL

**I**t looks like 1-2-3. It works like 1-2-3. All the commands are the same, all your old Lotus worksheets load into it without a hitch, and all your hard-earned macros run just fine. It's a near-perfect clone. At \$50, it sounds too good to be true. Or at least too good to be legal.

That's what Lotus Development Corp. claimed when it filed a lawsuit in the Boston Federal District Court on January 12, 1987. In two separate civil suits, Lotus claimed that both *VP-Planner*, published by Paperback Software, and *The Twin*, from Mosaic Software, infringe on its 1-2-3 copyrights. (The lawsuits also allege unfair competition under federal and state laws.)

Glance at today's PC and software markets and you're apt to think Lotus is just trying to frighten the industry, hoping to keep it in line and prevent anyone else from thinking about such a heresy as cloning 1-2-3. Although that conclusion might have been justified 10 years ago, the rules have since changed. Not only does Lotus have a solid case, but other program clones

are susceptible to similar copyright infringement actions. Even PC-compatible computers are in danger—the current rethinking of the copyright laws and vigorous prosecution of clone makers could change the face of the entire industry.

The driving force behind this change in traditional copyright concepts is a new appreciation for the creativity and effort involved in making a successful computer program.

Under the old rules, a huge industry sprang up to make and sell clone computers and software. Everyone seemed willing to offer a cheaper clone than the next guy. Long before Lotus filed its lawsuit, other companies had brought out programs that so closely resembled successful forebears that you needed a price list to tell them apart.

One classic example was the word processing program *NewWord*. Not just a *WordStar* clone, *NewWord* was actually written by former employees of *WordStar*'s publisher, MicroPro. There was no legal action against *NewWord*. In fact, the program code was recently sold to MicroPro for a multimillion-dollar sum. Or look at PC clones in general. Every one of them requires a BIOS to emulate an IBM PC, and every one of them has it. Yet, until now, IBM seems to have accepted the existence of the multitude of clone makers even though they have severely cut into its PC business.

This freedom-to-clone policy was a product of the contemporary interpretation of American copyright law. Until some recent court decisions were announced, the law was read by both product makers and their attorneys to restrict the copying of program code but not of program concepts. If you could duplicate the operation of a program without copying the underlying code, you could clone anything you wanted.

The current legal viewpoint is quite different. Copyrights are no longer considered code specific. Under the emerging interpretation of copyright law, one computer program can infringe on another even if it is written in a different language and designed for an entirely different operating system or computer. The "total concept and feel" or, alternately, the "look and feel" of two programs rather than their

Recent court decisions in cases such as Lotus's are setting new precedents for the copyright laws for computer products. Such outcomes threaten to change the entire PC industry.



## ■ COPYRIGHT LAW

underlying code, determines whether one is similar enough to be a copy.

Although the words "look and feel" are absent from the complaint in the lawsuit Lotus filed, its arguments follow this new doctrine. The company contends that the way 1-2-3 appears on the screen and the way it works is an intrinsic part of the company's copyright. By copying everything from the exact command names and the screen arrangement to the way the program works, Paperback and Mosaic are alleged to have infringed on the Lotus copyright.

If the subtle issues confuse you—such as exactly what constitutes the "look and feel" of a program—you're not alone. Various courts have struggled to sort out all the issues involved with software and copyrights. Although most have come up with answers, none is truly definitive. At least one leading case (*Whelan Associates v. Jaslow Dental Laboratory*, which will be discussed later) has been appealed to the United States Supreme Court, and its outcome may determine the fate of software copyrights—and the PC industry.

**IDEAL SITUATION** The problems begin with the purposes underlying copyrights. Copyrights, as well as patents, are legal rights granted by the Constitution that protect your creative work. But, contrary to what most people believe, neither copyrights nor patents offer protection of your ideas. One of the foundations of our country and society is that ideas are to be freely shared, that the exchange of ideas (and, one hopes, their critical assessment) leads to enlightenment. All ideas by their nature belong in the public forum. An exclusive right to any idea that removes that idea from public access and use is contrary to the entire philosophy of enlightenment which the Constitution promotes.

But automatically dumping all the fruit of one's creativity into the public domain removes much of the incentive for creative thought—the profits. So provisions for patents and copyrights were written into the Constitution.

Patents and copyrights deal with the manifestations of ideas rather than the ideas themselves. Patents prevent the appropriation of your implementation of an idea, putting your brainstorm to work ei-

ther as a specific product (say a servo-controlled knurling machine) or as a process in accomplishing some end (for instance, a method of making fertilizer from Congressional debates). Copyrights deal solely with the expression of ideas—how you go about communicating your idea to the rest of the world.

In exchange for granting a limited monopoly on the products of your creativity, patents and copyrights ensure that eventually the embodiments of your ideas will be in the public domain. Laws put definite limits on what can be patented and copyrighted, how long those respective rights survive, and the protections they provide. Patent protection is comprehensive but short. It prohibits unauthorized people or

ents covered functional applications. The subject matter of copyrights had to be non-functional.

This dichotomy presented immense problems in protecting programs. Established patent law has long held that mathematical algorithms cannot be patented because they are merely ideas. Computer programs are merely algorithms so they, too, were unpatentable. On the other hand, copyright law held that computer programs were functional and therefore were not proper subject matter for copyright. Furthermore, doubts existed as to whether software was an expression that could be copyrighted, notwithstanding its functionality, or whether it was an algorithm, purely an unprotectable idea.

## INDUSTRY COUNTERPOINT

Certain aspects of the user interface should be in the public domain, such as icons or moving cursor menus. To some extent we all try to adopt those techniques. It would be detrimental if the precedent set was so tight that developers had to invent new interfaces just to get around the copyright, especially if that meant that users would have to learn 72 ways to interact with different software packages.

On the other hand, I don't think protection should be limited to the code, it is immaterial whether the code is in BASIC or C or uses a different routine. If the product looks exactly the same to the user as somebody else's product, I believe the line of illegality has been crossed.

Since we're dealing with complex issues, the danger is that the line will be drawn too broadly or not broadly enough. It will be up to all of us to help draw the line in its proper place.

Ed Esber

President and CEO, Ashton-Tate

organizations from using your product or process—even if they should independently stumble upon it—for 18 years. Copyright protection is longer—up to your lifetime plus 50 years—but prohibits only copying your expression. You have no recourse against anyone who independently develops the same expression without copying yours.

The copyright law also limits its own subject matter and does not protect every expression of every idea. Although your idea can be retraced and reused, the expression must be original.

**DISCRIMINATION** Functionality is another distinction between patent and copyright. Under traditional theories, pat-

These roadblocks to the protection of computer programs have fallen away in the last 20 years. As automation swept through industries, the law recognized that software could be an essential part of a machine or a process and could be protected by a patent on the overall application. More recently, the patentability of software itself has been recognized.

Copyright protection for computer programs was assured in 1980 when Congress officially amended the law to include them. Under the new provisions, software is an expression, and copyrights on computer programs are just like any other, save a few additional rules. Unauthorized copying is forbidden unless it is necessary for the program's normal use. The law also



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## ■ COPYRIGHT LAW

provides that a single archival copy of a program can be made as a backup.

As with other copyrights, the new law puts no limits on the use of copyrighted material once it is sold. The purchaser of a copyrighted program—absent other agreements and legal entanglements—can dispose of it as he pleases, using, selling, or renting it. He is forbidden only from copying it.

Thus, when you buy an IBM PC with copyrighted material in its built-in ROM, you can later sell the computer with no worry that IBM will elbow in and try to collect an additional royalty. However, you cannot copy the protected BIOS code on which IBM's copyright subsists.

**IS IT REAL?** To establish copyright infringements, courts require that you prove two things—that you are the owner of the copyright and that the work you allege infringes on your copyright is indeed a copy of it. While the former is relatively straightforward, the latter can be troubling. In most cases you won't have a videotape of a scribe furtively glancing at your original, then scratching out his copy.

Consequently, the law has evolved a twofold test that substitutes for direct evidence of copying to relieve you of need for such espionage. Instead of showing the copying itself, the copyright owner can prove to the court that the alleged infringer had access to the original work and that a "substantial similarity" exists between the original and the alleged copy.

The recent change in copyright law for computer programs and the Lotus lawsuits hinge on the issue of exactly what constitutes this substantial similarity.

The old school of thought held that the expression of a computer program was the source code and, by extension, its machine-readable object code (the functioning program). The written code obviously expresses the underlying idea of the program. For two programs to be substantially similar under this philosophy, the actual program code would have to be the same.

For instance, under this interpretation of expression IBM could not copyright the idea of a Basic Input/Output System (BIOS) for its PC, and other people would be free to dream up their own input/output systems so long as they didn't peek into

IBM's ROM and copy the exact instructions IBM used. (So-called reverse engineering is allowed, but only to glean the ideas, not the actual expressions.) Each developer of an IBM-compatible BIOS would need merely to use different code to accomplish the same ends as the IBM original.

As a result, BIOS developers have gone to great lengths to be certain their engineers have not been contaminated with knowledge of the IBM BIOS and do not duplicate any IBM code. (When access and substantial similarity can be proved, even unintentional copying is forbidden.)

BIOS developers who have attempted to take the easy way out have suffered dire consequences. The ROMs in certain Ap-

.....  
**In exchange for a limited monopoly on the products of your creativity, copyrights ensure that the embodiments of your ideas will eventually be in the public domain.**  
.....

ple-compatible computers made by Franklin Computer Corp. were found to have been copied from the Apple original, primarily because the Apple ROM contained hidden and otherwise-nonfunctional code that, to the chagrin of the copycats, unambiguously identified its origins.

**TOUCH TEST** One way around the need to prove the literal transcription of program code is the audiovisual copyright. The images that make up a slide show, motion picture, or television program are copyrightable expressions. The same protection has been extended to the video displays generated by computer programs.

More important to the protections provided for computer programs is the emerging philosophy of "total concept and

feel." Under this doctrine the expression of the idea inherent in computer software is more widely spread. It's more than just the underlying program code or the video screens.

According to one court, the expression of an idea in software is the manner in which the program operates, controls, and regulates the computer in conceiving, assembling, calculating, retaining, correlating, and producing useful information either on a screen, in a printout, or by audio communication.

Under this doctrine, less reliance is placed on the exact verbal or visual similarity of the works. The nonverbal expression becomes paramount. The order in which the various screens are presented and the way the user interacts with the software become an acknowledged part of the way the software expresses its underlying idea.

The "concept and feel" legal copyright philosophy appeared long before the personal computer. As early as 1970 it was used in the prosecution of a copyright infringement action, *Roth Greeting Cards v. United Card Co.*, which involved commercial greeting cards. The court found infringement even though the copies were not identical. The copies merely conveyed the same mood and character—in some instances, nearly identical typesets—as the originals.

The first major computer case to use the phrase "total concept and feel" was filed by Atari against North American Philips Consumer Electronics Corp. in 1982. In this action, Atari alleged that the eat-the-dots game K. C. Munchkin infringed upon its copyrighted game PAC-MAN. Although the layout of the mazes, the number of gobbled-up dots on the screen, their arrangement, and the sounds and colors used by the two games were different, the court found that Atari's copyright had been infringed upon.

Among other conclusions, the court noted that slight differences between a copyright-protected work and an accused work will not preclude a finding of infringement. The overall similarities are more important than minute differences.

Probably the most important computer case to deal with these issues thus far is *Whelan Associates v. Jaslow Dental Lab-*



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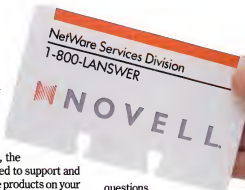
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## IN THEIR OWN WORDS: LOTUS, MOSAIC, AND PAPERBACK SOFTWARE STATE THEIR CASES

Mosaic believes that the lawsuit that Lotus has brought against it is motivated by Lotus's fear of losing market share and is not based upon valid legal claims. Lotus's goal is to deprive users of the real choice our products represent in terms of features and price.

We believe that there is an emerging consensus that a legal victory for Lotus would significantly stifle innovation and competition in the software industry. In addition to directly attacking our products, the lawsuit has the potential for restricting Mosaic's and other software developers' efforts to bring spreadsheet programs to market that are both compatible with and an improvement over existing programs.

Mosaic welcomes robust, ethical competition in the open market. We have engaged in this type of competition and we challenge all of our competitors, including Lotus, to join us in testing the value of our products in the marketplace rather than in the courts. We believe that the end users will be the principal beneficiaries of continued, healthy competition.

*Richard Dikran Bejian  
President, Mosaic Software Inc.*

### Lotus.

*Jim Welch  
President and  
Chief Executive Officer*

#### Innovation vs. Imitation: Copyright Infringement as an Industry Issue

We have noted with interest and disappointment an important trend that has begun to develop in some parts of our industry. Recently, more and more software development talent, money, and time has been spent on imitation rather than on true innovation.

Today's new computer-based development tools are beginning to reduce substantially the time and cost involved in producing so-called "software clones". Absent protection from copyright law, the true innovators in our industry (and those who back them) might become increasingly concerned whether the rewards of innovation adequately compensate them for the time and money they risk. That is the fundamental principle on which we based our recent lawsuits against Paperback Software and Mosaic Software.

The claims of our lawsuits should not be misunderstood. We do not claim ownership of the spreadsheet concept, nor do we claim ownership of the ideas embodied in such "user interface" features as the two-line moving-cursor menu or context-sensitive access to on-line help, which were popularized by Lotus products. Many software companies employ these and other ideas to make software easier to use, and we actively promote such usage. By publishing our internal file formats and offering developer toolkits, we have long encouraged innovative and compatible extensions to the capabilities of 1-2-3, while preserving our proprietary rights to the core spreadsheet program.

The lawsuits are targeted at two companies which we contend have deliberately copied virtually all of the ways in which 1-2-3 communicates to the user, including its menu structure and sequence, word selection, and macro language design, to the point where what they have produced is no more than a blatant imitation of the unique and valuable expression of the 1-2-3 spreadsheet program. This, we maintain, is traditionally and precisely what copyrights are intended to protect. For someone to copy the 1-2-3 spreadsheet by incorporating it in a package which may also contain

*Lotus Development Corporation 55 Cambridge Parkway Cambridge, MA 02142 617/377-6000*



additional distinct modules or functions is no different than for someone to plagiarize *Gone With The Wind*, and then merely add a new concluding chapter -- something which would generally be recognized as improper. The development of a successful software program is every bit a creative process in its own right, and a completed work or software design should be entitled to no less protection than any other mode of expression.

Why is this so important to a software innovator? A significant portion of the time we invest in designing a new software product results from translating a concept into what the user sees. This includes nearly every aspect of the way the user communicates with the underlying logic and data structure of the program. At Lotus, we spend enormous amounts of research time with our customers, testing and refining all aspects of the user interface. Naturally, we end up discarding more work than we actually include in the product; but the result is an expression of the concept that is easy-to-learn, easy-to-support, and which unlocks the full power of the underlying technology.

Usually, there are many different ways to express an underlying idea in software. In the computerized spreadsheet market, there are many different products -- all expressing the spreadsheet idea in different ways -- and several have become successful in markets all around the world. We expect that there will be even more ways of bringing the spreadsheet concept to computer users in the future. Where there are many different ways to express the same concept, U.S. Copyright Law protects the rights of those who arrive at innovative ways to translate concept into expression. It is under this protection that we are exercising our obligation to protect our intellectual property.

We feel that this is not purely a Lotus issue; it is an issue facing a large portion of the American software industry. The successful prosecution of these copyright actions should begin to channel some of the money and talent now earmarked for imitation back to where it belongs: in producing innovative products that serve computer users in ways they haven't been served before.

--Jim Manzi  
President and Chief Executive Officer

.....

Lotus has obviously decided it must attack its competition in court because 1-2-3 can no longer succeed on its own merit. This raises serious anticompetitive concerns for software users and publishers alike. The heart of the matter is that Lotus is attempting to stifle competition and maintain control of the market that allows it to charge its customers high prices for upgrades and add-ons.

Industry analysts generally agree that the huge share of the spreadsheet market held by Lotus has created a de facto standard of 1-2-3-format worksheets and commands. And compatibility with those worksheets is essential for any spreadsheet product to gain acceptance in the marketplace.

Corporate customers in particular have a tremendous investment in development and training based upon those worksheets. Without compatible products, these companies would have no choice but to continue to pay any price Lotus demands. The cost of converting and retraining an entire corporation to use a non-compatible spreadsheet program would be absolutely prohibitive.

No part of VP-Planner infringes upon any of Lotus's rights. VP-Planner is compatible with 1-2-3 only to the extent necessary to minimize retraining employees and redesigning the worksheets that the customers have developed. This compatibility is essential to meaningful competition and is completely lawful.

.....

Adam Osborne  
President, Paperback Software

.....



## ■ COPYRIGHT LAW

oratory, which is being appealed to the Supreme Court. The *Whelan* case concerns a dental office management program that was originally written for use on IBM Series One computers. The infringing copy was designed for the IBM PC and was written in an entirely different source language than the original. The trial court and an appellate court have held that the detailed structure of a program is part of its expression, not part of its idea, and that copyright protection is thus not limited to the literal elements of the program, that is,

protected by copyright. Rather, the duplication of file structure was merely one element of the evidence used to show that copying had occurred. Other programs might use the same file structure if they are otherwise not substantially similar to the original. For instance, a database should be able to use the same file structure as a spreadsheet without fear of infringement.

When two programs are designed to accomplish the same task in essentially the same manner, however, any similarity between them can be used as evidence point-

"total concept and feel" of the programs is, in fact, the same will have to be decided at trial.

For software developers, the emerging interpretation of the copyright law means that duplicating the operation of another program is ill-advised. Rewording or writing in a different programming language may be insufficient to dispel the substantial similarity between the new program and the original. And such acts could lead to a finding of copyright infringement.

So far the "total concept and feel" doctrine has not been applied to the computer BIOS. Whether it will be seems to depend on court interpretation of the copyright statute and case law. Certainly the elements of substantial similarity are present in the ROMs of IBM-compatible computers. For instance, they use exactly the same interrupt entry vectors (if they didn't, they wouldn't be compatible). Certainly the clones embody the same total concept as the original IBM BIOS. Although other copyright issues cloud the picture, copyright infringement lawsuits by IBM against the makers of compatible ROM are indeed possible.

You may feel predisposed against Lotus in its lawsuits. The company seems to be running against the hallowed traditions of the PC software community. Lotus is big and fat and has made the millions we wish we had. Moreover, many people see Lotus as the bad guy because the company clings to copy protection and seems to be trying to chase competition off the market to keep its price high. But the law is blind to such prejudices. Besides, if you were Lotus, you would want to pursue your legal rights, too.

And though you might think that Lotus's suits will be bad for competition and for the future of bargain-priced programs, it can be good, too. The "look and feel" copyright doctrine should provide incentive for program developers to be more creative. Not only will writing more creative programs help programmers avoid infringement, but the increased copyright protection afforded them should give them more monetary incentive to pursue creative work. □

Winn L. Rosch is a contributing editor of PC Magazine.

## INDUSTRY COUNTERPOINT

Too many people confuse their feelings about Lotus with their feelings about the Lotus lawsuit. They don't particularly admire Lotus so they don't want Lotus to win.

Users universally appreciate the power and clout of 1-2-3. But they dislike Lotus, rightly or wrongly, for what they perceive as arrogance—a company that taps you a non-discountable \$150, nearly half the street price of 1-2-3, for an evolutionary (not revolutionary) upgrade, that wants another \$150 for HAL when it should have been part of the Release 2.0 upgrade, and that clings steadfastly to copy protection unless you happen to buy 1-2-3 in bundles of 100 at a time, which even big corporations don't always do.

The Supreme Court once noted its most-famous cases involve not very nice people. But that doesn't deny them their day in court.

Lotus has a legitimate beef—Mosaic and Paperback Software are humming a tune written by Lotus. Unless competitors can prove Lotus monopolizes the spreadsheet market, in which case a different set of rules applies (as it has off and on to IBM), they should be building better spreadsheets, not cheaper versions of same.

Bill Howard

Executive editor, PC Magazine

the source code itself.

Inherent in these decisions is the growing recognition that the work and creative effort involved in writing computer software requires more than merely arranging program code. Developing specifications for file structures, the user interface, and other intangible aspects of the program may require more effort than the mechanical work of coding. Under the new software copyright interpretations, this substantial development effort is protected.

**NO MORE CLONES?** The implications may seem more ominous than they really are. For instance, in the *Whelan* case, the court based a portion of its finding of substantial similarity on the common file structure used by the original and infringing copy. However, this conclusion does not mean that the file structure itself is pro-

ing toward infringement. For instance, in the recently decided case of *Broderbund Software and Pixellite Software v. Unison World*, such design choices as the duplication of command names in the programs *Print Show* and *Printmaster* were evidence of substantial similarity between the two packages (the latter being the copy).

Even advertised claims can be used as evidence of substantial similarity and, hence, copying, as they were used in the *Whelan* case, in which the maker of the infringing program advertised that it worked just like the original.

The 1-2-3 clones subject to the Lotus lawsuit demonstrate many of these same similarities. They use the same commands, the same macros, the same file structures, and have even been advertised as being much the same as 1-2-3. Whether these similarities are substantial and the





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#### What is Cubit?

In brief, Cubit is an advanced software tool that automatically reduces the number of bytes required to store a file, then converts the file back to its original size when retrieved. Some programmers call this effect "data compression," others, "disk expansion." Either way, the result is the same.

Here's how it works. When Cubit compresses a file, it first compares each word to its massive English word dictionary. Words that match are reduced to a predetermined code of just one, two or three bytes each. It then saves the abbreviated version to disk. Decompression works just the opposite.

To accommodate other words and symbols, Cubit uses two more compression techniques. One assigns new, shorter codes to unusual words. Another compresses according to the frequency of character strings in non-text data. So no matter what kind of files you create, Cubit ensures maximum space savings.

Best of all, you'll be using the same fast, reliable data compression techniques used on mainframe computers for decades.

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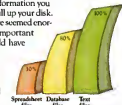
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# ROOTS: THE EVOLUTION of INNOVATION

Those most violently opposed to Lotus's lawsuits say that Lotus is playing a one-sided game—that it is attempting to stop others from copying aspects of its products, even as it has freely copied others.

This, they say, is counterproductive, since incremental progress is still progress. Users would be far worse off if they had to wait for conceptual breakthroughs or new paradigms instead of refinement. Dan Bricklin summed up this argument best in a wry twist of Isaac Newton's immortal words: "If you are going to see farther than others, make sure you're not standing on the shoulders of any giants."

Here is a brief genealogy of some of the most important products in our industry.

First and foremost, there is DOS. Back in the late 1970s, the 8086 was a little-used oddity in Intel's arsenal. The 8-bit 8080 and its derivative, Zilog's Z80, owned the market, and the operating system of choice was Digital Research's CP/M. Seattle

Computer Products, a small manufacturer of personal computer boards, built a CPU around the 8086 instead of the 8080 and Z80 boards that dominated the market at the time. It needed an operating system, and Seattle's Tim Patterson built a CP/M workalike, which he called 86-DOS. Every function call of CP/M was faithfully duplicated, taking into account the differences in register design of the 16-bit 8086 and the 8-bit 8080.

Programmers familiar with CP/M could move their software over to 86-DOS with little or no trouble. Seattle even offered a translation of Microsoft BASIC 5.21 for the 8086 (I still have a copy on an 8-inch floppy in my basement). This precursor to BASICA opened the 8086 to casual programmers in addition to serious developers.

The story of how Microsoft acquired 86-DOS and used it to convince IBM to build a 16-bit personal computer is an oft-told tale, and not germane to our discussion here. MS-DOS has changed completely since then, as it goes through endless enhancement and rewrite. But the story didn't begin with CP/M.

Gary Kildall, Digital Research's founder, found much to admire and emulate in Digital Equipment Corp.'s operating systems. Commands in RT-11 and RSTS are familiar to an MS-DOS user, and even more so to a CP/M user. The COPY command, for instance, is a streamlined version of PIP (Peripheral Interchange Program) in CP/M. Not surprisingly, many DEC operating systems sport a PIP command, too. DOS's DEBUG is command compatible with CP/M's DDT (Dynamic Debugging Tool). And so on.

Coming full circle, Digital Research took its multitasking operating system, Concurrent CP/M-86, and made it DOS compatible in the version called Concurrent PC-DOS. It's still available. In fact, IBM uses it as the operating system in its PC AT-based point of sale and intelligent cash register system. While I don't know where DEC's ideas might have come from, I'm reasonably sure they weren't all original.

**WAR OF WORDS** Word processors have tended to borrow heavily from the past. Some of them based their whole rea-

●  
*Everything is  
descended from  
something else. Even  
the most innovative  
product has its  
antecedents.*





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1-2-3				
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## ■ ROOTS



In VisiCalc, on the left, no matter how the adjacent cell is formatted, a long label will truncate when it reaches the column boundary. However, in 1-2-3, on the right, a long label will not truncate but will spill into the next columns. Both programs display the current cell address and cell contents (cell C7) on the top line, above the familiar "inverted L." VisiCalc has no date formats like 1-2-3 but will display in the scientific format, whereas in 1-2-3, a nine-digit number is displayed as asterisks in a column that is six digits wide.

son for being on their similarity to the ubiquitous Wang word processor. Wangs, as you will recall, were among the first office automation tools, and the secretarial schools turned out thousands of Wang-trained secretaries each year. As PCs replaced hard-wired, dedicated word processors in the workplace, it made perfect sense for software to capitalize on this tremendous pool of trained, talented workers. *MultiMate* was the first Wang imitator, and *OfficeWriter* followed soon thereafter. Of course, each made the necessary concessions to the PC's lack of ded-

**WORDSTAR WIZARDRY** Back in 1979, Seymour Rubenstein created *WordStar*. Through Rob Barnaby's programming wizardry, it became marvelously suited to the unruly world of dissimilar terminals, often without cursor controls, on CP/M systems. Rubenstein invented the cursor control diamond, using the E, S, D, and X keys in conjunction with the Ctrl key to move the cursor up, left, right, and down. It made good ergonomic sense. Prior to this, the best idea anyone had had for using the keyboard for cursor control was the Ctrl-H-J-K-L scheme pioneered in

ble, as are the editors in all the Borland languages. You might have thought that the dominance of the PC, with its well-defined set of cursor control keys on the numeric keypad, would eliminate the need for the control diamond. But it keeps surfacing in new products, even the sophisticated *View* accounting system.

**DATABASE DESCENDANTS** Two of today's most popular databases are descended from larger systems. Wayne Erickson is the chairman of Microrim, the *R:base System V* company. Not coincidentally, he was also the chief architect of *RIM*, a mainframe database program that Boeing Computer Services offered on its timesharing system. *R:base Series 4000* began *R:base Series 5000*, which began *R:base System V*. And they kept it all in the family.

Wayne Ratliff played a similar role in the genesis of *dBASE III*. While he was at Jet Propulsion Labs, Ratliff built *Vulcan*, a mainframe database. JPL used it for tracking things on the Voyager flights, and more. Ratliff got interested in microcomputers and rewrote *Vulcan* for CP/M. Then advertising genius Hal Pawluk renamed it *dBASE II*, ran a famous ad asserting that all other database products were "bilge pumps," and the rest is history.

*dBASE* has spawned a sizable aftermarket. First came the enhancement products that either generated applications or made

## INDUSTRY COUNTERPOINT

The lawsuits are about who should own the exclusive rights to evolutionary interfaces. In Lotus's opinion, it should. In my opinion, user interfaces that come about through evolution, as opposed to being revolutionary, belong in the public domain and should not be protectable. If Lotus wins its suit, it will be the only winner, while the entire software industry—in particular, the end user—will be the big loser.

Jerry Schneider  
President, Capital User Group  
Washington, D.C.

icated keys, and each picked up some benefits from the PC's flexible design.

Both products have moved beyond the original Wang paradigm, especially *OfficeWriter*. While secretaries of sound mind would never move back to the old beast, they remember their roots.

UNIX and adopted by *Magic Writer*, which later became *PeachText*.

Suddenly it was fashionable to be key-stroke compatible with *WordStar*. The control sequences, while in no danger of being mnemonic, were efficient. *dBASE II*'s built-in editor was *WordStar* compati-



## FROM VISICALC TO 1-2-3

*How much did 1-2-3 really borrow from its predecessor, VisiCalc?*

It has been argued that just as Paperback Software and Mosaic Software borrow the look and feel of 1-2-3, so too did Lotus borrow heavily from *VisiCalc*—and in particular from *VisiCalc*, Advanced Version, for the Apple III, which was the newest version when 1-2-3 was being written in 1982.

And, in fact, if you compare the command structures of the two programs, you can clearly see where 1-2-3 came from (see command tree diagram). But the differences are equally striking. 1-2-3 took *VisiCalc*'s basic command structure, expanded it, made the interface easier to understand by using words instead of letters, and added graphics and data management capabilities.

**COMMAND STRUCTURES** The familiar "inverted L" menu bar and slash (/) command structure were first invented for *VisiCalc*. Both programs have screens that display a spreadsheet of 20 rows by 8 columns. Above its spreadsheet, each package also has the familiar three-line sequence: the first line displays the current cell address and contents, and the second line is the prompt line, which pops up when you press the Slash key. But whereas 1-2-3 also uses the second line for cell input, *VisiCalc* uses the third line for that function. Moreover, *VisiCalc* uses only letters—A B C D E F G I K M P R S T V W—to indicate commands; in 1-2-3's vocabulary, commands are all in English: Worksheet Range Copy Move Print Graph Data Quit.

1-2-3 and *VisiCalc* share many basic formatting conventions. Both have the ability to make global worksheet settings. You can format cells in either program to accept numbers or text only, adjust the column width, hide the contents, or protect the cell so that its contents cannot be altered. With either package you can move or copy cells and create a win-

dow that scrolls with or without synchronization.

While 1-2-3 allows you to use and name ranges, *VisiCalc* does not, making its use more cumbersome. So, for example, to erase a single cell or a range of cells with 1-2-3, you issue the /Range Erase command. In *VisiCalc*, you must delete each cell individually, using the /Blank command.

And while you can use formulas for both packages, 1-2-3's use of named ranges means you could write the formula SALES-EXPENSES, where sales and expenses both stand for a range of numbers. With *VisiCalc*, formulas can use only cell coordinates, such as B35-C35. The lack of a range command means that *VisiCalc* cannot combine files. With 1-2-3 you can add a part of a file (named range) or combine an entire file.

*VisiCalc* can perform recalculations by row or column order, while 1-2-3 offers natural and iterative choices that reduce the possibility of circular or forward reference errors.

cal functions, including @DSUM, @DAVG, and @DVAR, for use in its database—a feature that *VisiCalc* does not have.

1-2-3 allows you to import ASCII, .DIF, .DBF, *VisiCalc*, or its own files. *VisiCalc* can read only its own and .DIF files. One thing that *VisiCalc* can do that 1-2-3 can't is store keystrokes in order to create macros. This command can be found in Lotus's HAL.

**GRAPHICS** 1-2-3's graphics aren't fancy. It offers six basic chart types and six fill patterns, for instance. But *VisiCalc* has no graphics capabilities to speak of. You can draw an extremely primitive bar graph, but that's it. (Mitch Kapor, before he started Lotus Development Corp., was the developer of *VisiPlot*, a program that created graphics from *VisiCalc* files.)

If you take a look at *VisiCalc*, it's easy to see where 1-2-3 came from. But even an experienced 1-2-3 user would need to read the manual to figure out how to use

## INDUSTRY COUNTERPOINT

The way people in our industry determine the best human interface for software is by rewriting existing programs. In the midst of that process, a genetic change occurs since programmers can't help but embellish. And those little changes are the genetic mutations that cause evolution in our industry.

Look-and-feel lawsuits are already impacting product development. And because hardware and software development takes so long, the uncertainty brought on by the case will affect the products we see for up to 3 years. Some of this effect will be irreversible.

Dan Bricklin  
Designer of *VisiCalc*

*VisiCalc* and 1-2-3 share many financial functions, such as @IRR, @RATE, @FV, and @NPV, and mathematical functions, such as @ASIN, @ACOS, @PI, and @SQRT. But 1-2-3 adds additional functions, including @RAND and @VAR. 1-2-3 has an entire set of statisti-

*VisiCalc*. Looking at *VisiCalc* is like looking at a grandfather and trying to figure out where his stellar grandchild came from.—Christopher Barr

Christopher Barr is a frequent contributor to PC Magazine.



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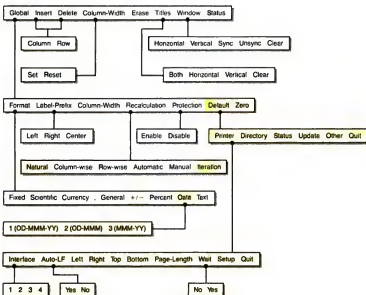




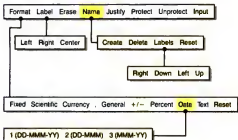
# 1-2-3, Release 1A, vs. VisiCalc, Advanced Version\*

How much does 1-2-3 owe to its predecessors? To find out, we compared its command structure with that of VisiCalc, Advanced Version, for the Apple III—the version available when Lotus was designing 1-2-3. Since Lotus changed the names of most VisiCalc commands, we compared the two programs function for function using 1-2-3's terminology as the basis for comparison. You can see that 1-2-3 is clearly a superset of VisiCalc.

## WORKSHEET



## RANGE



## COPY



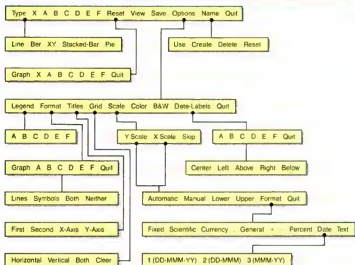
## MOVE



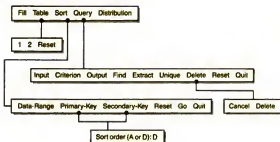
\*For the Apple III



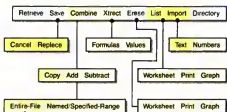
## GRAPH



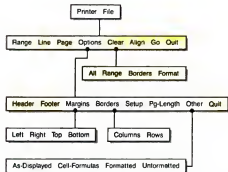
## DATA



## FILE



## PRINT



## QUIT



dBASE more flexible. Then came the compilers. While they stole some unit sales from Ashton-Tate, they also catapulted dBASE into new respectability. Competition dignifies a market and helped make dBASE III a real programming language. The existence of the compilers is still a problem for Ashton-Tate, but a nice one to have.

.....  
**Everything since the  
 idea of an electronic  
 spreadsheet has just  
 been refinement.**  
 .....

And then there was *VisiCalc*. First conceived for the Apple II, it was the original reason for business people to buy PCs. Before *VisiCalc* there were financial-planning languages and there were manual spreadsheets. The stroke of genius was the idea of an electronic spreadsheet; everything since has just been refinement.

Lotus's founder, Mitch Kapor, designed the original spreadsheet add-on product, a graphics program for *VisiCalc*. From then on, he worked very closely with Dan Bricklin and Bob Frankston, *VisiCalc*'s designers. It's only natural that 1-2-3 owed *VisiCalc* a large debt of gratitude. Moreover, it went to great lengths to be a superset of *VisiCalc*, as you can see from the chart on these pages. Originally, 1-2-3 used the F10 key to get you to the menu, but it was changed to the Slash key in order to be *VisiCalc* compatible and to overcome the possible objections of *VisiCalc* users. As an interesting sidenote, the F10 key has reemerged as Lotus's command invoker. Both *Metro* and *Manuscript* use it.

Dozens more stories could be told about products, innovations, flanking maneuvers, and head-on assaults by competitors. But through them all, you would find one dominant theme: people. Developers are influenced by powerful ideas and by one another. Marketers are influenced by powerful products and by market opportunities. Is it illegal when they join forces? We'll see.



# WHO OWNS *the* STANDARDS?

●  
*What constitutes a  
 standard in the computer  
 business, and where  
 do industry standards  
 stop and proprietary  
 extensions of  
 those standards begin?  
 Should we let  
 the courts decide?*

At the core of Lotus Development Corp.'s look-and-feel litigation are standards and the idea that standards are distinct, known (or at least knowable) things in the computer business that can be proprietary.

Standards come from many places—asserted by individual manufacturers (as with Hewlett-Packard's Laserjets), from industry committees (as with QIC tape backup specs), from committees working under the auspices of national organizations set up to promulgate standards (such as ANSI, the American National Standards Institute, and Germany's DIN, Deutsche Industrie Norm).

Standards are important, as anyone who's stripped the threads on a metric bolt with a British system nut can tell you. And standards promote not only convenience for users but also prosperity for whole industries, as the German firms flourishing under DIN specs can attest.

Unfortunately, Lotus seems to dis-



agree. Or at least, to have changed its corporate mind. In *The Beginning*, to be biblical, There Was *VisiCalc*, which did many nice things in tidy and logical ways. *Advanced VisiCalc* on the Apple III, for example, was a very high expression of the *VisiCalc* idea. But shortly after the ill-starred Apple III was released, IBM introduced the IBM PC, and not so long after that a little company called Lotus Development was formed and decided the PC offered a suitable platform for an even better spreadsheet.

They quite naturally built on the base laid down by *VisiCalc*. It is decent and just that giants should stand on the shoulders of giants; the injustice comes when pygmies try to clamber atop those broad shoulders. To see *VisiCalc*, *Advanced Version*, on the Apple III is to see an idea that was subsequently advanced in important ways by Lotus.

Today, to see *Words & Figures* is to see that idea advanced still further through the addition of full-featured word processing with "live" spreadsheets inside those WP documents. To see *Silk* is to see a different kind of extension of the idea, including powerful but effortless recovery of data lost because of simple negligence, power failure, or computer lock ups. To see *VP-Planner* is to see what happens when a multidimensional database grows from that seed. To see *The Twin* is to see what superior graphics can grow from that seed.

Yet those products and more may be at risk today. As Lotus moves in the courts to make proprietary not only its incremental additions to a standard but indeed the standard itself, it threatens others' efforts to stretch that standard in new and important ways.

**PLENTY OF STANDARDS** Part of the problem is deciding what a standard is in the computer business, and where industry standards stop and proprietary extensions of those standards begin. An absence of standards certainly isn't the problem: we have plenty of standards in the PC world: market standards, de facto standards, obscure standards, imperfect standards, widely ignored standards, incompatible standards, and those all-time favorites, nonstandard standards.

Indeed, the PC business is so in love

with the idea of standards that it's easy to set your own: in a business based on mutual acceptance of the idea that if you'll let me have my standard, I'll let you have yours—don't call me on my act and I won't call you on yours—just propose that something, anything, you've done is a standard and bingo! You're a standard-setter. That few others are likely to follow (or adopt, or honor, or in the current lingo "salute") the standard means little. It's a standard.

And it's all yours.

Many of the most widely used and adopted standards are, of course, nonstandards, the classic case among which is the RS-232C "standard" for serial cabling. The IBM PC AT's 9-pin D-shell plug shows we can't even agree on what size and type RS-232 connector to use, let alone how many pins it should have and how to solder them. Connect a Houston Instrument plotter to a Compaq Deskpro 386 running *AutoCAD*, or try to null-modem-cable a couple of different-make PCs, and you'll come to wonder what we mean by the word *standards*.

Indeed, RS-232C standards are honored mainly in the breach. It's gotten so bad, IQ Technologies has built a nice little business around building computers—including a sort of computer-in-a-cable, the *SmartCable*—to plug into our computers to figure out what the hell's going on on all those serial lines.

round, not oval, and boxes that are square, not rectangular—if that's what you want.

It's comforting, for example, to know that if you put a decimal-156 in a file, you're going to get a British pound sign, and if you insert a decimal-191, you'll get the upper-right-hand corner of a box. But while some printer vendors follow that assignment-of-extended-characters convention, others do not, certain that their way is better.

There's more than extended character assignments to the IBM/Epson standard, of course; VMIs (vertical motion indexes) are specified, too, in 1/64 units. But many printer vendors who claim to deliver IBM/Epson graphics standard compatibility use mechanisms that roll the paper up or down in other (usually larger) units, and so they must resort to mathematical trickery and some very coarse averaging to approximate the IBM/Epson 1/64 VMIs. The result for the user is that little white lines run across printed pages where the algorithm failed.

Even IBM and Epson part company on "their" standard when it comes to block graphics and italics. And of course IBM's *Proprinter* has its own slightly divergent "standard."

**OFF THE BEATEN PATH** Occasionally, the market chides vendors who stray too far off the path. Sometimes it works the other way: a new, nonstandard standard

## INDUSTRY COUNTERPOINT

In the short run, the end user benefits most from no copyright protection. But in the long run, it benefits users. Even though copyrights stop developers from putting out products for a very cheap price, it encourages them to spend time and money to develop superior products.

George Juarez  
President and CEO, Nantucket Corp.

In fairness, there are some standards fairly widely accepted in PCs. Perhaps best known is the Epson/IBM standard for printers. This standard is built on the idea that there is something good and virtuous about knowing just what you're going to get on paper when you place in a file one of the extended ASCII-character-set characters. And on the need for circles that are

survives because of some underlying value or a rich feature set in the product carrying that standard to market.

Toshiba's excellent dot matrix printers, for example, have their own, quirky ways of doing things, and for a long time, when few programs offered special printer drivers to match those quirks, Toshiba printers didn't sell very well. Eventually, as cus-



## ■ STANDARDS

tomers noticed how much they liked the near-letter-quality results of the Toshiba, software vendors were forced to write and distribute drivers for the machine. But it was close, and had Toshiba followed a more conventional path, users and software shops would have been a lot happier. And Toshiba would have made a lot more money a lot sooner.

Hewlett-Packard repeated that experience with its Laserjets. HP's obscure and irritating PCL (printer control language) for the Laserjets was so irritatingly non-standard that it required complex new printer drivers for software. A small indus-

proved 101-key keyboard for the RT PC, the PC AT, and the PC-XT model 286, IBM's sly humor appears again, with function keys drifting to the top and the Ctrl key falling to the bottom.

The Boys from Boca do love their parlor games. Meanwhile our fingers tangle into rheumatoid helixes, and users who must move among machines with two or more of the IBM keyboards suffer schizophrenia.

**MAKING STANDARDS PROPRIETARY** Making proprietary what had been generally thought of as an industry

## INDUSTRY COUNTERPOINT

The PC is a revolutionary (and profitable) tool, and as such it is natural that our industry argues over who owns what. These arguments will take years to decide, maybe decades. (Eventually, I believe, the courts will decide that the look and feel of a software interface can be protected, but that users' data, including macros, cannot be.)

In the meantime, software developers will have to consult a lawyer when designing their user interface, just as they now consult one in the choice of the name of the product. Writing software will become more complex.

The biggest concern of you, the PC buyer, will be that creativity will be stifled if new developers can't improve upon previous software efforts and if existing software companies won't improve their products because they don't have to.

But the PC is such a useful tool that you won't let the flow of innovations slow. And new chip architecture will also be the platform for innovations. So I think the industry will find a way around its problems to meet user needs and the challenge of new hardware.

William Lohse  
Publisher, PC Magazine

try grew up to write those drivers for users in love with the Laserjets' quality but in despair over how to get at that quality. Eventually, the Laserjets became such important factors in the market that applications software vendors themselves began including Laserjet drivers in their packages.

Occasionally, standard-setting vendors play little games with us; for example, IBM's keyboards. First came the Selectric, a highly ergonomic, much-admired, universally accepted standard. So naturally with the PC, IBM went to a new, wildly nonstandard keyboard, including such perverse touches as dinky Enter and Backspace keys. Then IBM fooled us again with the AT's keyboard, famed for its floating Esc key.

Now, in its third iteration, the new im-

standard (without, admittedly, the blessing of any industry committees) is a new direction in the computer business.

Consider computer languages. What if John G. Kemeny and Thomas E. Kurtz had decided Bill Gates and Paul Allen's BASIC had the look and feel of their own work? Would they—should they—have sued? Or should they have done precisely what they did: produce a later, better version, True BASIC?

What if Niklaus Wirth felt Philippe Kahn had appropriated his entire life's work with Borland International's Turbo Pascal? Should he have sued over rights to the older work or moved ahead with more elegant extensions of the same structured-programming principles, as he did with Modula?

Perhaps more to the point, should Soft-

ware Publishing have sued Symantec over Q&A's direct lift of the look and feel of the old PFS: series interface? Or was it in Software Publishing's better interest to drop that simple but primitive interface itself and move on to a much more sophisticated and useful look and feel in the new PFS: Professional series?

The Lotus action against Mosaic and Paperback Software is causing some confusion over copyright vs. trade secret vs. patent protection, over appearances vs. functionality, over progress vs. stagnation.

To the extent that Lotus addresses standards at all, it must acknowledge that millions of PC users embrace as a de facto industry standard certain conventions of where menus appear on-screen, which key gives access to those menus, and which sequences of keystrokes do familiar and repetitive things, such as file retrieving, worksheet erasing, and so on.

Asking users to abandon well-learned keystroke patterns when they move to other products and to abandon libraries of macros using those keystroke sequences, developed over hundreds of hours at the computer, has stirred up resentment among user groups and corporate PC users, to say nothing of Lotus's business colleagues.

Some take satisfaction that now, with the matter in the hands of the courts, a new and definitive set of rules, covering all situations, will emerge. They may be naive: few cases (and certainly not the two precedents tossed around in discussions of the Lotus litigation, *Broderbund v. Unison* and *Whelan v. Jaslow*) produce anything like clear and well-codified rules applicable to a broad range of similar matters. Such easy-to-follow codes are rare enough in statutory law and almost non-existent in case law.

More likely, we'll see more, not less, confusion over just what constitutes a standard, and over what can and cannot legally be improved upon in the software business. "Look and feel" is a clumsy and nebulous concept, and a perilous one upon which to ask the courts to hang the computer industry's dirty linen.

Jim Seymour is a contributing editor of PC Magazine.



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# WHO'LL THINK *of* SUING WHAT NEXT?

●  
*Brouhaha over  
moving bar; Marilyn  
Monroe estate sues  
Madonna for  
"look and feel"  
violations . . . and  
more lawsuits  
likely to occur should  
Lotus win its case.*

**J**uly 4, 1987: Secret memos from the Lotus executive suite reveal an attack contemplated against 1-2-3 clones but eventually abandoned. Lotus attorneys had planned to claim fraud and misrepresentation, arguing that "the claimed exact duplication of our product has not been achieved as advertised. For example, not one of these infringing products includes any sort of copy protection, which guard licensed Lotus users against unauthorized reproductions." Attorneys for the clone makers call this the "smoking disk," claiming it will bolster their defense in the forthcoming "look and feel" trial.

**July 19, 1987:** The Long Island Rail Road Club Car Corp. sues Lotus Development Corp. "We invented the moving bar," says an LIRRCCC spokesman, "and we will not permit it to be exploited without compensation."

**August 7, 1987:** Joining the "look and feel" fray, IBM chief John Akers an-

nounces to a convention of financial analysts that henceforth there will be "no free ride" for IBM software competitors. "IBM," says Akers, "will vigorously prosecute any vendor whose products attempt to imitate the look and feel of IBM's copyrighted software." In a subsequent speech, Microsoft chief Bill Gates announces his firm will vigorously prosecute any infringement of its signature Tab-key-and-Spacebar user interface. Inspired by the howls of laughter they receive from their audience, Gates and Akers agree to appear on "Late Night with David Letterman" as a comedy team.

**October 25, 1987:** The estate of Marilyn Monroe sues rock star Madonna for wholesale appropriation of MM's original "look and feel." "As the little copycat admits," says the Monroe estate's spokeswoman, "we are living in a material world."

**November 1, 1987:** Startup firm Homeric Software announces its *Tennyson* spreadsheet, advertised as "The Lotus Eater." *Tennyson* is said to include all the features of 1-2-3, HAL, and seven add-on products for one-third the cost of 1-2-3 alone. Homeric's stock jumps from \$1 to \$6.37 per share.

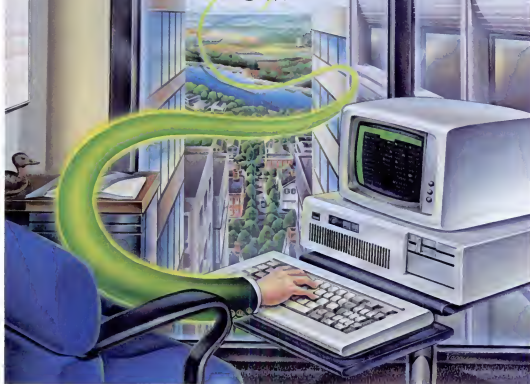
**December 22, 1987:** Lotus announces Release 2.2 of 1-2-3, which it terms "a major enhancement." Included among the two new features is the ability to use the simple four-key command /HAL to print out a purchase order for add-on products. Response to the \$275 upgrade is extremely lackluster.

**January 10, 1988:** 1-2-3 disappears from the select sales top ten for the first week in its history. Lotus sues Homeric for "illegal promotion of vaporware," a new statutory offense recently steered through the Massachusetts legislature by Representative Mitch Kapor.

**January 20, 1988:** In preliminary depositions, Homeric Software founder Odysseus Schwartz reveals that the forthcoming *Tennyson* program uses no standard Lotus commands. "We said that it would include all the features, and it does," Schwartz states. "We didn't say that it would be command compatible. What's so hard about using Backslash Finished Done (VFD) instead of Slash Quit Yes (QY), anyway?" Homeric's stock



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# REMOTE



## ■ WHAT NEXT?

sinks from \$8 to \$1.37 per share.

**January 21, 1988:** "But it directly reads and writes Lotus files," says Schwartz. "Honest." Lotus drops lawsuit; Homeric's stock drops to \$.37 per share.

**February 19, 1988:** Vince's Waste Disposal Products Inc. slaps a multi-million-dollar suit on Apple Computer, claiming the Macintosh's desktop icon directly violates the design of its patented "Garabaggio" can, right down to the ribbing and lid handle. Apple vigorously denies the claim, stating that its design in fact mimics a public-domain 2nd-century B.C. waste vessel unearthed at Knossos in 1917. In a related development, Union Carbide sues Commodore Business Machines for its shameless appropriation of the "Hefty Bag" metaphor.

**March 14, 1988:** Playboy's thriving *Look and Feel News* (Entertainment for Lawyers) is sued by the originator of the children's book *Pat the Bunny*. Attorneys claim the kiddie-lit tome's inclusion of a cotton-ball rabbit tail "was a clear precursor of the device in *LFN*'s latest issue."

**July 17, 1988:** The Madonna trial opens. The singer appears in court with her "new look," which one gossip columnist describes as "Kate Smith as a redhead."

Testifying for the plaintiff, Arthur Miller states under oath that the resemblance between "old-look" Madonna and his former wife is indeed uncanny. "Attention," he says, "must be paid."

**August 1, 1988:** Testifying for the defense, Joe DiMaggio maintains that Madonna's look may well be similar but that otherwise "Marilyn was in an entirely different league."

**August 3, 1988:** A mistrial is declared when Sean Penn decks the female judge presiding over the case.

**November 1, 1989:** Cartier sues Apple for infringing on one of its classic watch styles. A spokesman claims: "Since the watch is visible more often than any other Macintosh icon, we believe we are entitled to compensation." Apple vigorously denies the charges, claiming the watch specifically copies a public-domain Louis XV sundial. Japes an Apple spokesman: "Is Cartier claiming it makes watches with hands that don't move?"

**January 7, 1989:** Ford Motor Corp. rocks the auto industry by winning a lawsuit claiming "look and feel" rights to the steering wheel. "There is nothing inherent in the idea of a wheel for steering a vehicle," states Detroit judge Henry Ford VIII. "Indeed, many other possible meth-

ods can be and are used." Ford's stock shoots up to record highs on industry speculation of huge license fees from other manufacturers.

**February 8, 1989:** Dr. Ferry Porsche states that "we will not pay a single mark to any competitor" to license steering wheels. Instead, the firm debuts the "Flexible Flyer" user interface, a "steering bar," for its U.S. models. Porsche claims that Ford's hard-line stance has forced other manufacturers to be more creative and that the state-of-the-art steering bar improves performance significantly over "primitive" devices.

**March 8, 1989:** The LIRCCC sues Porsche America for appropriation of its "moving bar" concept. "If it's a bar and it moves, we sue it," says a spokesman.

**August 6, 1990:** After remaining on the sidelines in the "look and feel" controversy, IBM announces that it has quietly bought up the rights to all known readable type fonts with serifs and stands ready to license the alphabet.

**August 8, 1990:** Apple, in a clever countermove, reveals it has acquired the rights to all known sans serif fonts. This means all extant characters of the standard alphabet must be licensed by one of the two computer giants.

**March 4, 1991:** After much congressional debate (including Senator Adam Osborne's stirring oration, "Millions for Defense, but Not One Cent to Put 'One Cent' on the Penny"), Congress declares Japanese the national language in response to the pledge of Japan Inc. to offer an unlimited royalty-free license in perpetuity for its Kanji character set.

**1992:** As its original "look and feel" lawsuit drags through the courts, Lotus announces its long-awaited Release 3.0 of *1-2-3*. It has most of the features of Homeric's *Tennyson*, plus a brand-new user interface, at just <sup>15</sup>/<sub>100</sub> the price, but analysts do not expect the revamped product to make significant inroads on *Tennyson*'s 73 percent market share. Asked for comment, Homeric's Schwartz laughs: "Me? Sue? Hey, that's not the way I do business. In fact, I just fired all my lawyers and hired 50 more programmers." ☐

*Stephen Manes is a contributing editor and columnist for PC Magazine.*



"We invented the moving bar," says a LIRCCC spokesman, "and we will not permit it to be exploited without compensation."



# Think You Need an AT?

# Think Again.

## TABLE OF BENCHMARK RESULTS

This table shows the results of the processor/coprocessor speed tests using the April 1986 release of PC Magazine's 'PC Labs Benchmark Tests'. These are public domain programs, and are available on diskette

from PC Magazine, or via the PC Magazine bulletin board. These results were obtained by us at PCSG, and are not yet official published PC Magazine figures.

The last line in the table, the

Norton System Information Test, is not from PC Magazine, but is part of the popular 'Norton Utilities.' The version we used was 3.1, which is the latest version but may not give identical results to older versions.

	IBM PC	IBM AT	BREAKTHRU 286	
Clock speed in MHz (IBM PC is 4.77)	4.77	6	8	12
Empty Loop	1	1.99	3.34	5.15
Integer add from memory	1	3.35	4.41	6.02
Integer multiply from memory	1	6.06	6.55	8.3
Floating point without coprocessor	1	3.33	4.42	5.76
Prime number test	1	1.95	2.85	3.7
Lotus 123 macro (640K)	1	2.64	3.69	4.62
Lotus 123 macro (256K)	1	1.77	3.54	4.38
Norton System Information Test	1	5.73	7.34	10.2

In every case but clock speed the numbers indicate how many times faster a test is performed than on a regular IBM PC.



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<b>LIGHTNING™</b> speedup software	FREE with Breakthru \$89.95 purchased separately	

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software can

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1986**

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**BREAKTHRU 286-12**

for numeric intensive applications. A 16K cache memory provides zero-wait-access to the most recently used code and data. Look at the benchmark tests box to see how our two boards compare with the PC and the AT. Speed is addictive. You'll never want to go back to slow again.

Third, you have full compatibility. All existing system RAM, hardware, and peripheral cards can be used without software modification. Our boards operate with LAN and mainframe communication products and conform to the Lotus/Intel/Microsoft Expanded Memory Specification (EMS). Software compatibility is virtually universal.

Fourth, these are the best. There are several other boards on the market. We at PCSG have compared them all, but there simply is no comparison. What we discovered is that many cards being sold offer only a marginal speedup in spite of their claims and others are just poorly engineered. For example some boards have a cumbersome mechanical switch for going back to 8088 speed, but the Breakthru boards have speed switching software that allows you to drop back to a lower speed on the fly for timing sensitive applications. The 8MHz BREAKTHRU 286 and the 12MHz are unequivocally the best executed and most completely reliable speedup boards manufactured today.

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Second, it is advanced. The BREAKTHRU 286 replaces the CPU of the PC or XT with an 80286 microprocessor that is faster than the one found in the AT. You have your choice of 8MHz at \$395 or 12 MHz at \$595. You can plug in an optional 80287 math coprocessor chip

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# YOU BE *the* JUDGE

●  
*The facts of the Lotus case against The Twin and VP-Planner are clear-cut; it's the law that's murky. Here we give you the facts. Study them, and then fill out the reader response card to give us your opinion.*

**L**otus Development Corp.'s suits against Mosaic Software and Paperback Software International are examples of those cases, so curious to laymen, in which the facts are easier to establish than the law.

The facts are simple: First, *VP-Planner* and *The Twin* deliberately imitate the functions and user interface of *1-2-3*, Release 1A. Second, they also add new functions. And third, they are both written in original programming code that is not a copy of *1-2-3*'s code.

While copying source code is clearly illegal, it's not yet clear whether copying the functions or user interface is illegal or whether adding functions makes any difference. The decision in the Lotus cases, among others, is destined to play a large part in setting the future direction of copyright law.

Here we provide you with the facts you need to form your own opinion of the case. The similarities and differences between the products are laid out in this discussion, in the command tree diagrams (shown here) and in the screen shots of all three programs.

*PC Magazine* also wants to provide a forum for you to voice those opinions. To join the debate, please fill out the Editorial Survey and return it to us. We will publish the results in an upcoming issue.

**DELIBERATE COPIES** There's no doubt that both *The Twin* and *VP-Planner* were written to look and feel like *1-2-3*. The very first sentence in the *VP-Planner* manual is: "*VP-Planner* is designed to work like Lotus's *1-2-3*, keystroke for keystroke." Paperback Software clearly thought it had nothing to hide.

Although *The Twin*'s name certainly suggests imitation, its manual is more coy. It mentions *1-2-3* only to say that you can find a text file on the program disk that lists the differences between *The Twin* and *1-2-3*.

But both programs do just about everything *1-2-3* does in almost exactly the same way. It's no accident, for example, that all ten function keys do the same things. Nor is it an accident that a keyboard command as complex and seemingly arbitrary as

```
/ P P R Backspace Home . End  
Home Enter O O U Q G Q
```

will, in all three programs, define the same print range and send it to the printer without special formats.

*The Twin* and *VP-Planner* were just as diligent in copying *1-2-3*'s macro language. Identical computer languages are as likely to spring up independently of each other as identical human languages are. Nonetheless, whole pages of macro code run identically in all three programs.

In fact, for a point-by-point account of how *The Twin* and *VP-Planner* resemble *1-2-3*, just read the user manual for *1-2-3*, Release 1A. Nearly everything in those 360 pages is likely to be true of both *The Twin* and *VP-Planner*.

**DIFFERENCES** Of course, *The Twin* and *VP-Planner* differ from *1-2-3* in many significant ways. The most important is in the code itself. Although you'd have to decompile the programs to be sure, no one is suggesting that anyone copied *1-2-3*'s source code. That would clearly be a copyright violation. And, in fact, both programs require more memory than *1-2-3* and process macros and calculations at dif-



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- ☐ Complete in the box.
- ☒ **ALL OF THE ABOVE.**

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Unit pictured with optional RGB Color Monitor.

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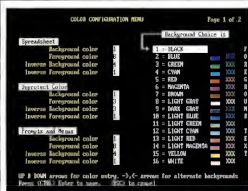
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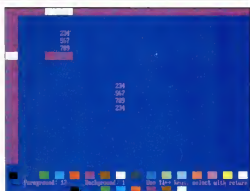




## ■ YOU BE THE JUDGE



Both *The Twin* and *VP-Planner* improve on *1-2-3*, Release 1A, which does not allow users to customize screen colors, by including color menus. Here you can see the *The Twin* color menu. *The Twin* also has similar hardware selection menu that lets users configure the program much more easily than is possible with *1-2-3*.



With *VP-Planner's* color menu, on-screen colors change as you move the cursor to the sample color block, so you can evaluate different color combinations before you decide which is best.

ferent speeds—evidence that at the engineering level they are probably entirely different programs. Rather, Mosaic and Paperback Software went original code to do the same things *1-2-3* does.

Then there are cosmetic differences. *The Twin* and *VP-Planner* screens put the control panel (where menus appear and where you enter data) at the bottom of the screen rather than at the top as *1-2-3* does. This doesn't change the way the programs work. Since copyrights clearly protect appearances of things, Mosaic and Paperback Software may have made this change for purely evasive reasons.

*The Twin* and *VP-Planner* also differ from *1-2-3*, Release 1A, in that they add appearances that appear in *1-2-3*, Release 2.0. Since Release 2.0 was out by the time the imitators went to market, there's a very good chance that these improvements to Release 1A were nothing more than imitations of 2.0.

Finally, *The Twin* and *VP-Planner* both have features that are not to be found in any release of *1-2-3*. For *The Twin*, the most important of these is advanced graphics. For *VP-Planner*, it's multidimensional databases and the link to *dBASE*. Here, the command trees in the comparison charts are noticeably different.

**THE TWIN** Each program also diverges in the ways that it differs from *1-2-3*, Release 1A. For instance, *The Twin* has raised the number of rows in the spreadsheet from Release 1A's 2,048 to 2.0's 8,192. It also supports the 8087 math co-processor, uses a sparse memory matrix, and displays the time and date on the screen. It increases the number of date formats from Release 1A's three to 2.0's five. It has added Release 2.0's @rate function and can display a table of range names.

*The Twin* features not found in any release of *1-2-3* include the @and, @or, @not, and @mrr functions; a constant display of available memory; and the ability to print a spreadsheet with its column letters and line numbers.

*The Twin* also improved *1-2-3's* edit mode. You can toggle between overwrite and insert modes, and delete everything to the right of the cursor by hitting Ctrl-End. Also, instead of having to specify a print range every time you print, *The Twin* prints the entire spreadsheet if you don't tell it to do otherwise.

*The Twin* also adds commands for moving around within the spreadsheet. When shifted with the Ctrl key, PgUp, PgDn, Home, and End take you to the top, bottom, right, and left edges of the active

area of the worksheet. These are handy additions, and each has its own macro language keyword, like (chome) and (cpgdn).

*The Twin* has also corrected *1-2-3's* lack of support for color. You can use *The Twin's* selection screen to change colors quickly and easily. A handy menu lets you configure the program to your hardware, which is a much easier method than messing with *1-2-3* device drivers.

Other improvements over *1-2-3* are its ability to do DIF translations and print a graph without leaving the spreadsheet. *1-2-3* makes you exit the program and enter another module. One slightly eccentric change allows you to use the Spacebar and Backspace keys to move the cursor when you select items from a menu.

*The Twin* makes two really big improvements over *1-2-3*: it is not copy protected, and it can do real graphics. The graphics are so different from *1-2-3's* that they are almost completely incompatible. (For a complete review of the two packages' graphics capabilities see "Graphics Software on Display," *PC Magazine*, Volume 6 Number 5.) Graphs saved with *1-2-3* don't work in *The Twin* and vice versa. *The Twin* lets you draw quite presentable pie-bar charts, 3-D charts, and charts with two y axes with different



# MAKE YOUR VOICE HEARD

These questions were formulated by PC Magazine's editors and representatives from software and hardware manufacturers. We're interested in your response.

Companies take legal action against other companies to protect their assets and their markets. These actions, however, may be taken without due regard for the most important person, the customer. *PC Magazine* feels that those of you who use these products or who have responsibility for providing computing services to others have opinions that have not yet been heard.

This is your chance to express how you feel about the look-and-feel issue. For every company taking legal action on this front, there are dozens more awaiting the outcome of the current litigation. We will tabulate and publish the results of this survey and will also disseminate them directly to software publishers.

1. What overall effect do you think the look-and-feel issue is having on the industry?

- ☐ Positive
- ☐ Negative
- ☐ None

2. As a result of the Lotus lawsuits are you less likely to buy 1-2-3 "clones"?

- ☐ Yes
- ☐ No

3. What do you think of manufacturers who bring look-and-feel litigation against other software companies? Check the responses that most closely echo your own feelings. (Multiple responses are permitted.)

- ☐ a. They're right; they're only protecting their intellectual property.
- ☐ b. It scares me; you never know whom they'll turn on next.
- ☐ c. They're forcing other software publishers to be more creative by not duplicating existing standards.
- ☐ d. They're forcing training costs up by causing needless change when consistent operation is more important.
- ☐ e. They're ignoring the best interests of software users.

4. How much better must a new product be than an existing one that gets the job done before you'll invest the replacement and training costs?

- ☐ 20%
- ☐ 40%
- ☐ 60%
- ☐ 80%
- ☐ 100%
- ☐ More than twice the performance or function

5. Have you purchased products that would be considered "clone" software in the popular sense?

- ☐ Yes
- ☐ No

6. If you have purchased such products, what were your main reasons for doing so? (Multiple responses are permitted.)

- ☐ a. They saved me/my company money.
- ☐ b. They offered a superset of the features in the original products.
- ☐ c. Their performance was adequate for my needs.

7. Have you rejected from consideration products that might reasonably be considered "clone" software?

- ☐ Yes
- ☐ No

8. If you have rejected such products, what were your reasons? (Multiple responses are permitted.)

- ☐ a. I need greater support than the smaller software publishers can offer.
- ☐ b. Price is not an object for these products.
- ☐ c. The performance penalty in using other than the original software is too great.
- ☐ d. Such products might be illegal.
- ☐ e. I'm skeptical that these products are really as compatible with the original as the manufacturers claim.

9. What, in your mind, defines "clone" software?

- ☐ a. Products that duplicate the appearance and command structure of another product, yet sell for a lower price.
- ☐ b. Products that use the same command structure and general appearance but provide additional commands, functions, or greater performance.

10. Suppose one of the largest hardware or software companies (call it "Goliath Corporation") embarked on a strategy to continually survey small-company software offerings (for example, from "David Enterprises"), picking the best of them, replicating the look and feel of those packages—perhaps with minor modifications—and selling them under the Goliath brand name. Should Goliath

- ☐ a. be found guilty of copyright infringement and be required to forfeit the profits on the David Enterprises clone, or
- ☐ b. be allowed to continue the practice legally?

11. What is your job title?

12. Do you work in the MIS/DP department?

- ☐ Yes
- ☐ No

13. If not MIS/DP, in which of the following departments do you work?

- ☐ Infocenter/PC services
- ☐ Accounting/finance/auditing
- ☐ Engineering
- ☐ General management/administration
- ☐ Other

14. Is the company or organization for which you work involved in the manufacture or sale of personal computers or related products?

- ☐ Yes
- ☐ No





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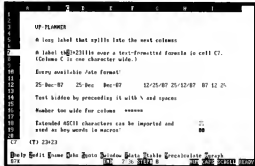




\*\*\*\*\*

A sample 1-2-3 screen. In 1-2-3, Release 1A, you can hide data in two ways: In a column that is only one character wide, a text-formatted formula (cell C7) completely disappears from view. To see this hidden text, you place the cursor on that hidden cell, and the contents will appear on the first line of the control panel in the upper-left-hand corner of your screen. You can also hide text by preceding it with a backslash (\) and a series of spaces. Notice 1-2-3's date formats. Also, 1-2-3 can import extended ASCII characters and use them as keywords in macros. A nine-digit number in cell F17 is displayed as asterisks in a column that is six columns wide. All status displays are turned on. Here 1-2-3 is not in Ready mode.

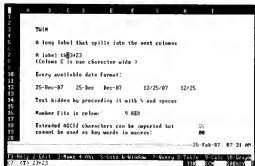
\*\*\*\*\*



\*\*\*\*\*

In the same display in VP-Planner, the formula in cell C7 does not truncate the label in B1 but is displayed through it. The contents of C7 are displayed in the control panel at the bottom of the screen. As in the other two packages, you can hide text by preceding it with a backslash (\) and a series of spaces. Current cursor location is shown in reverse video on the borders of the screen. Like 1-2-3, the number in F17 that is too wide for the display appears as a series of asterisks. VP-Planner can import extended ASCII characters and use them as keywords in macros. Function key menu, time, and remaining memory are displayed at the Ready state. All status displays are turned on.

\*\*\*\*\*



\*\*\*\*\*

This is the same display on the The Twin screen. The formula in cell C7 truncates the label that begins in B1. Notice that the contents of C7 are displayed in the control panel located at the bottom of the screen. You can hide text, however, by preceding it on the control line with a backslash (\) and a series of spaces. Notice the available date formats. The Twin displays the nine-digit number in F17, in scientific notation, in a column that is six characters wide. The Twin can import extended ASCII characters but cannot use them as keywords in macros. The Function key menu, time and date, and available memory are all displayed at the Ready state. All status displays are turned on.

\*\*\*\*\*

scales. For titles, you can choose from 11 different type fonts, using any 3 in one graph. You can also graph up to eight data ranges, compared with 1-2-3's six, in twice as many colors, eight instead of four.

Since *The Twin* is part of Mosaic's modular integrated program called *Integrated 7*, it is designed to pass graphs back

and forth with the associated word processor and graphics program. *The Twin* prints graph "slides" to disk for this purpose.

Strangely enough, *The Twin* creates .WKT files that 1-2-3 can't read; it takes a special translation step to create a standard .WKS file. *The Twin* can read 1-2-3, Release 1A or 2.0 files, though, and will

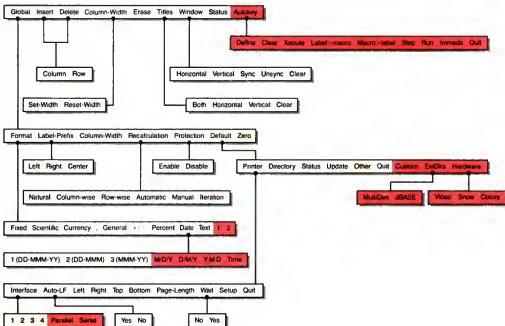
auto-load any file named AUTO123.WKS, AUTO123.WK1, or AUTOTWIN.WKT.

Although *The Twin* occasionally chokes on very complex 1-2-3 macros, it's a cheap, serviceable 1-2-3 compatible for anyone who needs good graphics and 8087 support.

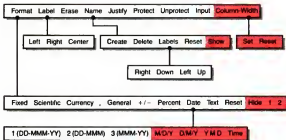


VP-Planner borrows much of 1-2-3's nomenclature and command structure. The major ways in which it parts company with 1-2-3 is in its Autokey function, which allows you to create macros within the spreadsheet, in its ability to link spreadsheets, and in its database capabilities, which let you read, write, and update dBASE II or III files from within the spreadsheet.

## WORKSHEET



## RANGE



## COPY

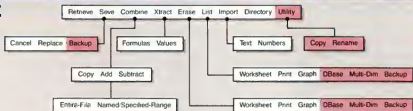


## MOVE

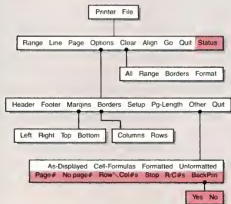




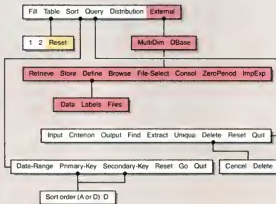
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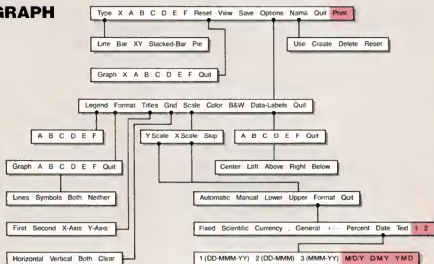
## PRINT



## DATA



## GRAPH



## QUIT



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Second-Generation Hewlett-Packard LaserJet Series II laser printer with cable and 512KB print buffer (expandable to 4.5MB). The versatile 8-page-per-minute Series II prints a range of page sizes.

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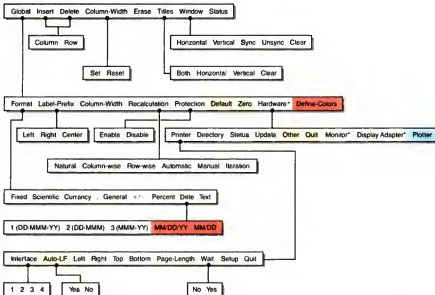
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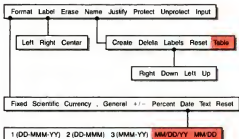
## 1-2-3, Release 1A, vs. The Twin

For the most part, *The Twin* uses 1-2-3's command nomenclature and command structure. The one glaring exception is the structure of the commands for graphics functions. *The Twin*'s graphics are more extensive than 1-2-3's. For this reason, we show *The Twin*'s graphics commands in the inset and highlight additional functions.

## WORKSHEET



## RANGE



## COPY



## MOVE



\*In 1-2-3, these choices are made during the installation process, and the next menu level is accessed through Default.

## OPTIONS

- Not in 1-2-3
- in both 1-2-3 and The Twin

## Titles (first, second, third)

- Size (1-8)
- Color (1-8)
- Font (1,2,3)
- Justify (L,C,R)

## Footnotes (first, second, third)

- Size (1-8)
- Color (1-8)
- Font (1,2,3)
- Justify (L,C,R)

## Axes

- X-axis label
- Y1-axis label
- Y2-axis label
- X-axis color (1-8)
- Y1-axis color (1-8)
- Y2-axis color (1-8)
- Display X-axis? (Y/N)
- Display Y1-axis? (Y/N)
- Display Y2-axis? (Y/N)
- Display grids? (Y/N)
- Display frame? (Y/N)

## Scale

- X-axis Min Max
- Y1-axis Min Max
- Y2-axis Min Max
- Scale log or linear
- Labels and legends size (Sm Lg)
- Units between X labels
- Ticks between X labels
- Units between Y1 labels
- Ticks between Y1 labels
- Units between Y2 labels
- Ticks between Y2 labels

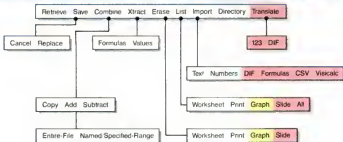
## Attributes

## ● Legends (1 2 3 4 5 6 7 8)

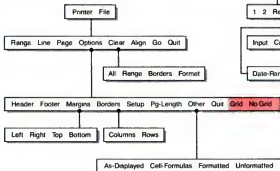
- Color (1-8)
- Pattern (1-8)
- Highlight (Y/N)
- Y-axis (L,R)
- The data range or value position number
- Bars (Cluster or Stack)
- Bar data range for pre-bar
- Subtitles for pre-bar charts
- Pre Bar
- Bar



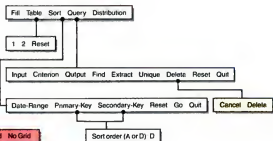
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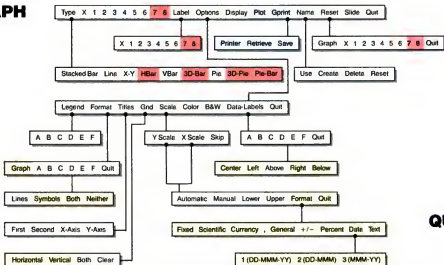
## PRINT



## DATA



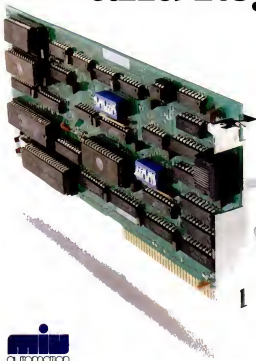
## GRAPH



## QUIT



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## ■ YOU BE THE JUDGE

**VP-PLANNER** Like *The Twin*, *VP-Planner* made some of the same obvious improvements to Release 1A that Lotus did in Release 2.0, as well as some that Lotus should have but didn't. Like Release 2.0, it uses a sparse memory matrix and displays the time of day on-screen. It includes hidden format, range name tables, zero column widths, and the @now and @time functions that 1-2-3 got in Release 2.0. *VP-Planner's* @dsds and @dvars functions that give standard deviation and variance for a sample are not found in any version of 1-2-3 and neither are the @root and @poly functions for solving polynomial equations.

*VP-Planner* increased the number of date formats, as did Release 2.0, but it stretched the size of the spreadsheet even further, to 9,999 rows. Like those of *The Twin*, *VP-Planner's* menus for changing screen colors and configuring the program make 1-2-3 look clumsy. *VP-Planner* also lets you print graphs without exiting to another program and print a spreadsheet with row numbers and column letters.

Many of *VP-Planner's* improvements are unique and useful. Every time you save a file, *VP-Planner* gives you the option of saving the previous, on-disk version of the file as a backup. It has an Autokey macro mode that saves "live" keystrokes as mac-

ro, sign, along with the number.

Other improvements include an option to print one spreadsheet while you work on another, and the ability to split the screen into six windows instead of the two that 1-2-3 offers. *VP-Planner* has a utility for copying and renaming disk files that you can run within the program. To get to Release 1A's utility you had to leave the spreadsheet.

The macro language has a new /xw statement that lets you build a pause into a macro that can be as long as 65,000 seconds. Macros can also use a relative goto, in which the coordinates of the destination cell are taken from the contents of other cells. Another nice touch is that the single-step debugging mode displays the execution of slash commands in the control panel. 1-2-3 displays nothing. Finally, you can write macros that change the screen color. This way you can flag unexpected calculation results by simply turning the screen red.

*VP-Planner* also added another character for use in database search criteria. If you precede a search string with the dollar sign (\$), *VP-Planner* will find embedded occurrences of the string.

One somewhat dubious *VP-Planner* "improvement" is the option of using function keys, as well as first characters to

use dBASE files to store large databases that won't fit in your spreadsheet—a vast improvement over 1-2-3, which can work only with databases small enough to fit into memory. You can also use dBASE

**V**.....  
*VP-Planner* and *The Twin* are supersets of 1-2-3, Release 1A, with a large degree of upward compatibility.  
.....

files as macro libraries.

Another wholly original *VP-Planner* feature is multidimensional databases, which allow you to consolidate spreadsheets and design different reports from the same data. You define dimensions, categories, and logic statements, and *VP-Planner* will organize data in sophisticated ways. The whole process can be run with a macro. Multidimensional databases are complex, and their explanation takes up over 100 pages of the *VP-Planner* manual.

**DO DIFFERENCES MAKE A DIFFERENCE?** Obviously, neither *VP-Planner* nor *The Twin* is an exact copy of 1-2-3. Each is a superset of 1-2-3, Release 1A, with a large degree of upward compatibility. The additions to 1-2-3 made a difference to potential users, and *VP-Planner's* added features seem to have made it more popular than *The Twin*. On balance, I would say that *VP-Planner* differs from 1-2-3 more than *The Twin* does.

But will any of these differences make a difference in court? Would the case be the same if either *The Twin* or *VP-Planner* were merely perfect clones and nothing more? Is it legal to copy a user interface only if you use it to do something new, or can you copy it if you add nothing to the original?

We won't know until the case is resolved and the law is clarified. In the meantime, you have the facts. ☐

Jared Taylor is a contributing editor of PC Magazine.

## INDUSTRY COUNTERPOINT

Developers and publishers everywhere need to examine their consciences. We can protect our livelihood through innovation and staunch support of our customers and their needs; or we can protect our hides with an army of lawyers and build a fortress around the status quo. We feel the mission of all software publishers today is to provide better software tools. It's that simple.

Philippe Kohn  
Founder and president, Borland International Inc.

ros. Autokey even lets you include slash commands and prompts you for the proper elements of these commands.

*VP-Planner* lets you design custom numeric formats that use spaces, periods, or other characters instead of commas to separate every third digit. You can also use custom characters instead of a period as the decimal point and format cells so that any combination of letters appears as a curren-

cy menu choices. You can erase a range with /F3-F4 or /RE. The equivalent function key numbers appear next to the menu choice in reverse video, which can be distracting.

*VP-Planner* completely parts company with 1-2-3 in its database capabilities. You can use its /Date External commands to read, write, and update dBASE II or III files from within the spreadsheet. You can



# EZQueue 3000 . . . . Peripheral Sharing Plus!

*The Giltronix EZQueue™ allows up to twenty-four computers to simultaneously share one or more laser printers, dot matrix printers, or plotters. In just a few minutes, you can configure the EZQueue to efficiently manage a single shared printer or multiple printers depending on your need. Ten simple to use and expandable models are offered, each with up to two megabytes of dynamic buffering.*



## Multiple Printer Sharing

EZQueue is ideally suited to simultaneously access and share multiple printer

## Increased Productivity

EZQueue goes beyond the cost advantages of sharing expensive printer resources. In a communication environment, files containing data for printing mailing labels can be directed through EZQueue to a dot matrix printer. At the same time, files containing data for letter quality output requirements can be directed to a specific laser printer containing the desired paper style. Accounting departments can share the various printer resources needed to print invoices or checks. The flexibility of EZQueue can enhance productivity and reduce total system cost in virtually any workgroup environment.

## Dynamic Buffering for Simultaneous Inputs

Buffering is dynamically allocated to one or more printer queues allowing simultaneous input from each of the attached computers with no waiting. When a shared printer is busy, files are stacked up in the EZQueue's buffer and output to the designated printer when it is ready to receive the next file.

resources. Each EZQueue is provided with Giltronix GX software, a DOS compatible program that makes selecting a desired printer a snap. Once installed on a computer, a few keystrokes will invoke GX from within any software program to quickly select the desired printer resource. Both serial and parallel interfaces are supported.

## Simple Installation

No special cables are required because each EZQueue serial port automatically adjusts to signal directions. "Smart" ports, a "21" step installation guide and Giltronix toll-free tech support guarantee a successful installation with minimal effort.

## Expandability

Unlike competitive systems, EZQueue's buffer size and number of ports can be expanded as your system grows. A minimum EZQueue starts with six serial ports, two parallel ports and 256K bytes of dynamic buffering. Serial ports can be added in six port increments up to a total of twenty-four serial ports. Buffering can be added in 256K byte increments up to a total of 2 megabytes.

Headquarters  
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In California, call (800) 521-1330

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# Major WORD PROCESSORS

*Minor (and not-so-minor) enhancements bring greater clout and flexibility to word processing's corporate and professional best-sellers: DisplayWrite, MultiMate, OfficeWriter, Microsoft Word, WordPerfect, WordStar, and XyWrite.*

## Get Better

The word processor market continues to be a battlefield. It has defied efforts at long-term domination by several of the largest firms in the software industry. After years at the top, for example, *WordStar* has dropped out of the race, although with the recent release of Version 4.0, MicroPro hopes to move back up.

Unlike the spreadsheet market, in which Lotus's 1-2-3 has a majority share, and databases, in which *dBASE III Plus* (and previously *dBASE II*) stands markedly ahead of competitors, no one product dominates in the word processing field.

Instead, it's a chummy club of insiders. A half dozen programs and companies share three-quarters of the market and another 75 programs compete for the remaining quarter. The leading companies, in rough order, are WordPerfect Corp. (*WordPerfect*), Microsoft Corp.

(*Microsoft Word*), Ashton-Tate (*MultiMate Professional Word Processor*), MicroPro International Corp. (*WordStar*, plus *WordStar 2000* and *Easy*), IBM Corp. (*DisplayWrite* and *Writing Assistant*), and Software Publishing Corp. (*Professional Write* and *First Choice*, plus predecessor *PFS:Write*).

The market is increasingly defined by business rather than casual or home use, and a prime marketing tool has been feature enhancement. If one vendor adds a capability, so do the others. In recent releases, we've seen enhanced spelling checkers, thesauruses, outline processors, and most recently, desktop publishing capabilities.

In this article, we'll take a look at the latest enhancements of the leading programs for professional and corporate use, and some with potential to crack the top half dozen. They are all at or near the top in their various categories, but



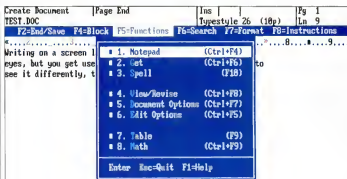
## ■ WORD PROCESSING SOFTWARE

they have distinct personalities of their own and appeal to different audiences. *PC Magazine* has reviewed all of the products at least once. This article brings you up to date on what's been added in *DisplayWrite 4*, Version 1.10, *Microsoft Word*, Version 3.1, *MultiMate Professional Word Processor*, Version 3.6, *OfficeWriter*, Version 5.0, *WordPerfect*, Version 4.2, *WordStar*, Version 4.0, and *XyWrite III*, Version 3.1.

### DisplayWrite 4, Version 1.10

*DisplayWrite 4*, released in June 1986, from IBM Corp., is the result of a continuing evolution from a former dedicated word processing package. In IBM's case, much of the knowledge was put to exceptionally good use. IBM has priced *DisplayWrite 4* at \$495, only \$45 higher than *DisplayWrite 3*.

IBM is, of course, a major factor in the typewriter market as well, and the company obviously used its experience to create the original product, which was released in April 1984, that is sensitive to the way of office personnel work. It's nice to have an on-screen center point and an indicator of paper edge when you're designing a document; *DW4* has them by default, as have earlier versions of *DisplayWrite*. There are also some nicely intuitive key assignments: destructive Backspace, Ctrl-cursor



*IBM's DisplayWrite 4 features a Notepad function that allows you to merge your ASCII output with another company's package. The function, which is reached with Ctrl-F4, allows you to create an ASCII file from any part of your work, up to and including your entire document.*

key for word left and word right, Ctrl-Home and -End for top and bottom of page. To be sure, there are also a couple of odd ones. Ctrl-PgUp, for example, moves the screen left.

Codes for such things as boldface (Ctrl-B) and underline (Ctrl-U or Ctrl-W for word underline) are hidden, but cursoring across them takes two keystrokes, one of which will show the code in its location and a message in the status line such as "Underline Off." Some of these functions show in the screen display, but some don't, such as word underline.

When you open a document for revision, you automatically return to your last position in the text unless you set that function off in your profile. (*DW4* permits multiple profiles to be stored and used as needed.) Page orientation raises its ugly head here, unfortunately. You always have to move from page to page. It takes only an annoying second or so, but why not just draw a line on the screen? Or, for example, why must you enter only headers and footers when you're at the top of the page?

The other major IBM personality quirk here is the insistence that no one could be

interested in using any other products. This is a common IBM attitude, of course, so you're probably familiar with it already. Still, if you try to type or otherwise look at the contents of these files, you'll be surprised at what you see. It's not your usual ASCII file. What's a writer to do? Selecting the Utilities option on the main menu, and the conversions under that, gives you Revisable Form Text and Final Form Text, two IBM standards great for use with (you guessed it) other IBM products, including *DisplayWrite 3* and the mainframe version, *DisplayWrite 370*.

This last point, of course, is highly significant. Shops wishing to exchange documents with their mainframe will find it very useful. But what if you just happen to want some ASCII output to merge with (horrors) someone else's package? Well, it can be done, but it took some finding. It turns out that there's a nice Notepad function that allows the creation of an ASCII file from some piece up to and including the entirety of your document. The function is accessed by pressing Ctrl-F4, and it works just fine—what you're reading was largely composed in *DisplayWrite 4* and

### PC FACT FILE



*DisplayWrite 4*, Version 1.10  
IBM Corp.  
P.O. Box 152560  
Irving, TX 75015  
(214) 556-4000  
List Price: \$495  
Requires 256K RAM,  
two disk drives, DOS 2.0 or later.

**In Short:** IBM's latest upgrade of its own word processing package is friendlier than previous versions. Liberal use of windows and good context-sensitive help screens make *DisplayWrite 4* better than ever. Not copy protected.

CIRCLE 69 ON READER SERVICE CARD



then moved into something else.

Although the new features are relatively few in number, they're far-reaching in their impact. The biggest achievement of *DW4* is its simplicity of interface, which is by far the most attractive that IBM has come up with to date and compares favorably with any of the other products reviewed here. Perhaps the most telling way to illustrate that is to note that *DisplayWrite 3* needs two manuals while *DW4* requires only one, and except for advanced functions, you won't need to refer to the manual very often.

Unlike the other packages discussed here, *DW4* automatically comes up with black letters on a white screen. If you find this distracting, a quick press of the F1 key windows up help. At that point you get several options, including an index. Checking out the several pages of help with the PgUp and PgDn keys tells you that colors may be set to your liking in either character mode (the default) or All Points Addressable (APA) mode.

Of course, things still aren't perfect; it took some more reading to find out how to get to a place where these selections could be made. It turns out that asking for a user profile to be created makes you name one. Then, and only then, do the menus start to show up. This document orientation is a holdover from earlier *DisplayWrite* versions and it can be an annoyance, albeit a minor one.

On a CGA, *DW4* left a black border turned on defining the screen quite nicely. It then took two lines for status information as it did in earlier versions, with a few enhancements, and provided a menu bar, making it the only program reviewed here, except *Microsoft Word*, to do so. After that, a tab line and you're on your own.

**USER COMFORT** Windows are used extensively and to good effect. They allow you to keep what you're doing in front of you instead of throwing it off into the back-ground somewhere all the time, which just contributes to a higher comfort level for the less technical user. The simpler functions are at the top of the menu trees. Unless you need advanced features, you'll probably rarely go more than two levels deep. If you do, the context-sensitive help is usually an adequate guide. The use of

menus and several levels of windowing permits *DW4* to function as a very simple product for people who need to use it that way, while permitting access to advanced features as they become needed.

Another attractive enhancement is the large limit on document size: 2.4 megabytes. Another is the newly enhanced save options. You can now quit without saving, save and exit, or repaginate and save.

Finally, there is the ultimate whiz-bang feature—voice annotation. It requires some additional equipment, including a board. Some people will find this useful, but for most of us it will turn out to be the 1987 version of the remote infrared keyboard.

IBM has made a significant departure from the roots of dedicated word processing. By leveraging its credibility, gained through mainframe exchange, into a new generation of products, Big Blue may well be leading the pack into a new style of product. To critics, *DW4* can best be summed up by saying, "It's not as bad as it used to be." Either way, IBM's presence in this market is far from a dominant one, and the impact of *DW4* is still to be seen.


## Microsoft Word, Version 3.1

*Microsoft Word*, one of three professional-category products reviewed here, along with *WordPerfect* and *XyWrite III*, differs in some very significant ways from the others: the detail of the bit-mapped WYSIWYG display (including on-screen italics, boldface, and underlining), the on-screen menu, and style sheets, all of which combine to make *Word*, first introduced in April 1983 by Microsoft Corp., the program of choice for many people with laser printers.

This assumes, of course, that your equipment is up to the task. You really need an EGA or Hercules card. Monochrome and CGA monitors work in *Word*'s character mode (which also makes *Word* run faster), but they don't do the program justice. You also have to read the manual ultra-carefully if you have a CGA, or you'll miss the fine print that says to start *Word* with the /C (character mode) option. Otherwise, you'll get a screenful of gibberish.



## FACT FILE



**Microsoft Word, Version 3.1**  
Microsoft Corp.  
16011 NE 36th Way  
Box 97017  
Redmond, WA 98073  
(206) 882-8080

**List Price:** \$450; upgrade from 3.0, \$25; from 1.0, \$100. Free upgrade for any version purchased after September 1, 1986.

**Requires:** 256K RAM, two disk drives, DOS 2.0 or later.

**In Short:** *Microsoft Word* is a full-featured professional package with excellent screen-mapping on supported devices and a highly developed interface with on-screen menu bar and mouse support. It has extensive capabilities for supporting high-quality printers. Not copy protected.

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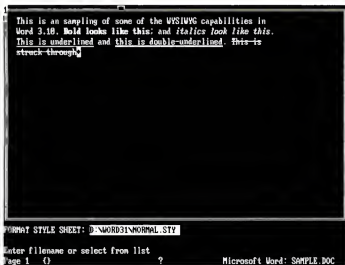
The second distinguishing feature of this new \$450 *Word* is that along with *WordStar*, it is one of only two of these packages to have a basic on-screen menu. It's relatively unobtrusive in terms of the amount of screen space it takes up. *Word* uses the bottom four lines for the menu, which can be dispensed with entirely once you're familiar with the controls.

*Word*'s most impressive characteristic is its ability to create style sheets, or what could be called macro libraries for formatting. They're one of the truly distinctive word-processing capabilities on the market. *Word* permits you to create multiple sets of style sheets, each of which may have a series of styles defined within it and assigned to a code.

For example, you could have a standard set of building blocks used for formal letters, including a "TO" block, a salutation, a standard paragraph, closing, and so on. Each of these could have a standard left and right margin, justification style, font, and more. By collecting them into a style sheet, you make it possible to instantly reformat an entire document from business letter to personal letter, for example, if both have style sheets of their own and the same labels were used for the building blocks. By assigning a different style sheet, you could completely alter the ap-



## ■ WORD PROCESSING SOFTWARE



Microsoft Word's bit-mapped WYSIWYG display includes such impressive features as on-screen italics, boldface, and underlining. Word also lets you create multiple sets of style sheets, each of which may have a series of styles defined within it and assigned to a code.

pearance of the document immediately.

Style sheets are an innovative and highly useful capability. This makes it all the more mystifying that Microsoft has really shied away from supporting and promoting them, much as Lotus created and then ignored its macro facility with *1-2-3*. Microsoft would do well to introduce style sheets and teach their use throughout the manuals and tutorial. Instead, style sheets are relegated to the advanced-techniques sections that are ventured into only by the real power users. What a shame.

Finally, *Word* supports several mice. If you like them, you love them; if you don't, you won't care. Nevertheless, the mouse support is impressive, well thought out, and a significant enhancement if it's your cup of tea. Even mouse-haters will find final editing involving sentence transpositions or block moves to be markedly quicker than with the cursor keys.

**A SMALL STEP UP** Unlike the major upgrades of *WordPerfect*, Versions 4.1 to 4.2, and *XyWrite III*, Versions 3.0 to 3.1, the upgrade of *Word* from 3.0 to 3.1 released in October 1986 was fairly unexcit-

ing; only one really significant item was added—a thesaurus. It's attractive and has 220,000 words. To invoke it, you select a word and press Ctrl-F6. You get the part of speech, a list of synonyms, and the ability to go straight to a secondary lookup (synonym of a synonym) from the usual menu bar. The window will appear in either the upper or lower half of the screen, depending on where the selected word is.

The other enhancements are really quite minor: a line-count message from a number of the Print options (why not make it a selectable item?) appears at the bottom of the screen. The message ignores blank lines, headers, footers, and hidden text (unless it's been made visible). The Options menu has had three new items added: date format (MDY or DMY), time format (12-hour or military format), and decimal character (period or comma). Remaining enhancements are additional printer and graphics hardware support, the ability to edit read-only files (but you must save them to a new filename—a wise precaution), and path support for the initialization files *NORMAL.STY* and *NORMAL.GLY*. The latter allows you to set up

directories for specific styles of documents and make the standard settings the defaults in that directory.

If you're thinking about converting to *Word* from another program, to get the most benefits and fewest frustrations you should have an AT or compatible with an EGA or Hercules graphics display, a mouse, a laser printer, and some patience. *Word* fundamentals come easily, but the program is most rewarding to a power user willing to spend time learning. *Word*'s on-screen tutorial is the classiest of the industry. If you're still baffled after reading the help screens on a topic while using *Word*, it invokes the tutorial for that topic. Nobody else does that.

All in all, *Word* 3.1 is a rather unspectacular upgrade, exactly what you'd expect by normal standards, with a decimal point change. It's only by comparison with some others here that this seems relatively minor. On the other hand, competition is what business is all about, isn't it? Perhaps Microsoft will rally behind *Word* with some really major new features next time around, most likely the enhancements added to the Macintosh *Word* 3.0. They already have one of the finest products in the field; its unique personality will probably ensure its popularity for some time to come.

## MultiMate Professional Word Processor, Version 3.6

*MultiMate Professional Word Processor*, now produced by an Ashton-Tate company, Multimate International Corp., is among the elder statesmen of the field. The latest version, 3.6, lists for \$595. Since its development as a clone of standalone Wang word processing in 1982, *MultiMate* has enjoyed leading status as a high-end word processor aimed at the corporate user: typically, secretarial staff responsible for correspondence, memos, and the like. It remains a page-oriented product, primarily intended for the creation of smaller documents.

*MultiMate* had its personality stamped by what it emulated: the Wang word processor. Dedicated word processors had keyboards designed to facilitate the func-



## ■ WORD PROCESSING SOFTWARE

tions most frequently performed by their operators. The PC keyboard had to be tailored to permit those uses to be easily accessible. This was born from the keyboard template, a necessity for most of us who are unable to remember all the Ctrl- and Alt-key combinations.

While *MultiMate* was hardly the first to come up with those new key combinations (as any fumble-fingered *WordStar* veteran will tell you), it did provide a stunning array of useful features accessible through those combinations—so many, in fact, that it was virtually impossible to remember more than a few of them. On-line help was provided and assigned to Shift-F1, allowing the use of unshifted F1 as a "GoTo" key. Between the help and the little keypad stickers, most users were able to navigate reasonably successfully around the package.

As time passed and competition heated up, *MultiMate* stayed right in the fray, extending printer support, providing some excellent (and some not so excellent) utilities for document conversion to other formats, proportional spacing support, macro creation, spelling checkers, and so on. In the ultimate nod to their origins, the folks at Multimate even introduced a replacement keyboard designed with the word processing user in mind.

*MultiMate*, Version 3.5, had automatic table-of-contents generation, footnote and section numbering, line and box drawing, two insert modes (push-over and the original—and awful—drop-down mode), and enhanced library, search, and help functions. The speed of the spelling checker, long a sticking point, was upgraded with Version 3.5, and repeated copies of the same word were automatically corrected starting with that release.

Two new products were shipped free initially with Version 3.5: *Graphlink*, a graphics-into-text integrator from the

American Programmers Guild (which sells it separately as *InSet*), and *On-File* (a file-management system that's a little too primitive to be called a database), which can manage your documents based on the document-summary screen you can fill out when you create or edit a document. Neither utility is being given away any longer, and one wonders how successful either product will be when sold as a standalone.

**USEFUL UPGRADE** With Version 3.6, introduced in January 1986, *MultiMate* takes a number of further steps, including a

## A TAXONOMY OF WORD PROCESSORS

**B**ecause word processors may be intended for different markets, direct comparisons between every program reviewed here aren't always possible. For instance, you'd be crazy to try to use *MultiMate* over *XyWrite* for a 150-page thesis because that's not *MultiMate*'s purpose in life.

To avoid apples-and-oranges comparisons, *PC Magazine* divides word processors into three mainstream and four specialty categories: corporate, professional, and personal; and scientific, integrated (for example, *Framework II* and *PFS: First Choice*), outline processors, and those requiring special operating system extensions. See "The Business of Words," *PC Magazine* Volume 5 Number 2, for reviews of 76 leading programs.

• **Professional programs**, sometimes tough to learn but rich in features, are for writers, analysts, executive secretaries and academics. *WordStar* typifies the genre. *Microsoft Word*, *XyWrite*, and *WordPerfect* are professional programs, too. Expect to pay about \$250 on the street for a professional word processor, \$400 to \$500 list price.

• **Corporate word processors** meet the needs of clerically staffed WP departments typically found in big companies who graduated from Selectrics to dedi-

cated Wang word processors in the 1970s. Often they're page-oriented, meaning the document is treated as a series of linked pages, rather than a single flowing document. *MultiMate* is the prototypical corporate program, along with *DisplayWrite* and *OfficeWriter*. They're priced roughly the same as professional programs.

• **Personal word processors** are for executives who bang out their own memos, other occasional users, and home users. They typically cost \$50 to \$100 on the street. *PFS:Write* is a personal word processor. The best of the bunch: *PFS: Professional Write* (also the most expensive, at \$199 list), Simon & Schuster's *New World and Textra*, bargains at \$19.95. See "Word Processors: More Power for the Money," *PC Magazine*, Volume 5 Number 4, for reviews of 18 low-cost programs.

Obviously, the boundaries overlap, especially professional and personal programs infiltrating the corporate environment, or in medium-size businesses that decide to standardize on one product for secretaries, executives, and power users. *WordPerfect* has strong penetration in corporations, as does *Word*, and more than a few companies have found *PFS:Write* adequate for their typing pool.—Bill Howard

### PC FACT FILE



**MultiMate Professional Word Processor, Version 3.6**  
Multimate International Corp.  
Ashton-Tate  
52 Oakland Ave.  
East Hartford, CT 06108

(203) 522-2116

**List Price:** \$595; upgrade from 3.1x through 3.30, \$50; from 3.31, \$100; from 3.50, \$60.

**Requires:** 320K RAM, two disk drives, DOS 2.0 or later.

**In Short:** One of the originals, *MultiMate Professional Word Processor* is a full-featured, page-oriented package modeled on Wang dedicated word processing. It has a wealth of utility functions and can convert to and from numerous formats. Not copy protected.

CIRCLE 68 ON READER SERVICE CARD



## ■ WORD PROCESSING SOFTWARE

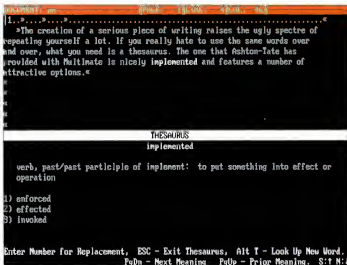
column mode that supports up to eight columns per page in both snaking mode and bound-column mode. (Snaking is what a newspaper does: begins the second column with what follows the end of the first. Bound columns limit their contents to that column; eight may be put on a single page.) Individual format lines for each column, unequal column lengths, block manipulation of columns, and right-justified text are included. These features extend what are being called the desktop publishing capabilities; other vendors are pushing these capabilities very strongly, and it's probably fair to say that this is MultiMate's catch-up effort.

The spelling checker has been upgraded from 80,000 to 110,000 words, including common medical and legal terms. A thesaurus with 40,000 words was also added; this can be used for definitions, like a dictionary, or as a reference tool for alternates. (See the accompanying screen shot for a look at how the thesaurus appears.) You invoke the thesaurus with Alt-T, a nice mnemonic, and the text is moved up to the top of the screen if necessary so that you can see the word in context and still get the full thesaurus window.

A typewriter mode was added for "direct to paper" work for envelopes and labels, either a character or a line at a time. A "hot print" feature that allows you to do a quick single page to printer dump was also added in Version 3.6.

A keyboard merge facility for importing data from external files in a number of formats (including, of course, dBASE) has been included. This is a good first step, but it should be easier to use. Some problems were fixed, including extension of the search function to include footnote symbols, section numbers, and double underscore. Some much-needed enhancements, like the ability to edit custom dictionaries, support for proportional-spacing fonts on the Hewlett-Packard Laserjet and the IBM Quietwriter, and additional document conversion options (Wang PC, IBM's Document Content Architecture, and Lotus's 1-2-3), are also included.

Over 400 printers are now supported, and the extensive definition and editing capabilities for Printer Action Tables and Character Width Tables are still there for the power users. You can even set your



A thesaurus with 40,000 words was added to MultiMate Professional Word Processor, Version 3.6. You call it up with Alt-T, and you can move the text to the top of the screen, if necessary, so that you can see the word in context and still get the full thesaurus window.

cursor speed and acceleration rate now, which can be a real boon.

Overall, Ashton-Tate has its work cut out for it. *MultiMate* lacks the luster and market leader image it had 2 to 3 years ago. Perhaps the most needed change is a document-oriented option for users who want more flexibility.

### OfficeWriter, Version 5.0

Comparable (and frequently compared) with *MultiMate* because of its similarity to Wang dedicated word processing, Office Solutions' *OfficeWriter*, priced at \$495, surmounts the page orientation it has also retained, like *MultiMate*, by permitting the user to scroll from one page to another smoothly, showing the page break as a line across the screen. This is a vastly more comfortable approach than *MultiMate*'s insistence on redrawing the screen for each new page. The memory-resident document processing is faster than *MultiMate*'s as well, and these two features alone may be largely responsible for significant

amounts of *OfficeWriter*'s inroads into *MultiMate*'s territory in the last year.

There are other reasons, of course. One is the intelligent mapping of keystrokes to the keyboard. There are many *MultiMate* users, for example, who don't know that Alt-F3 and Alt-F4 are "beginning of line" and "end of line," respectively. On the other hand, I'd be surprised if most *OfficeWriter* users didn't know that Alt-Cursor Right key and Alt-Cursor Left key will do it for them. Other *OfficeWriter* examples of intelligently designed cursor movement include Alt-Spacebar, Alt-Period, and Alt-Enter for next word, next sentence, and next paragraph. The fact that Alt plus the delimiter for that unit will get you there is easy to remember.

This is not to say that you don't need help, of course. *OfficeWriter*'s unique reference ruler not only gives you the less-obvious Alt (and other) commands not covered in the usual function-key template but also a nice pitch map or line-measurement tool for 10- and 12-pitch lines.

The features added to Version 5.0, released in December 1986, read like a summary of that year's developments in the



# That Was Then And This Is Now.



## Introducing WordStar® Professional Release 4.

You remember when we first came out with WordStar. From day one it became, as some described it, a classic. Over one and a half million of you snapped it up.

But that was then and this is now. And now there's a new WordStar. WordStar Professional Release 4 for the IBM PC and compatibles. With the same familiar command sequence and file format you've grown to love. Yet with all the improvements you've been asking for.

You're going to have a field day.

## With over 125 new features, it's like a wish list come true.

Imagine, a WordStar Professional with, increased speed, undo, keyboard macros, Word Finder® Thesaurus, line/box drawing, improved printer support, multi-line headers and footers, and onscreen boldface/underlining.

Catch your breath. We're not done.

There's also 14 function math, sub-directory support, go to page, and an improved spelling correction and Mail-Merge. There's even an optional 40 function key interface. Not to mention over 100 other enhancements.

## And it's got people in the know talking.

People like Michael J. Miller of InfoWorld\* who described WordStar Professional Release 4 as "faster than ever" and "good enough to cause a WordStar revival."

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\*February 16, 1987 issue

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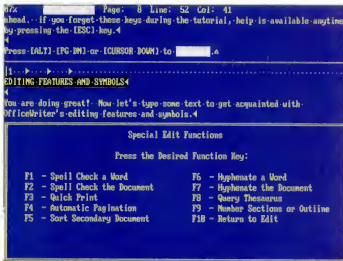
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CIRCLE 502 ON READER SERVICE CARD



## ■ WORD PROCESSING SOFTWARE



The Special Edit Functions menu of OfficeWriter, Version 5.0, provides access to many important features, including a hyphenation facility and a 40,000-word thesaurus that provides not only antonyms and synonyms, but related, contrasted, and compared words.

word processor market. Since introducing the product in April 1983, Office Solutions has been doing a good job of keeping up with the Joneses on features, as well as raising the ante here and there.

One of everybody's favorites these days, multiple columns in snaking or parallel mode, shows up here with a very nice and typically intuitive implementation. The format line is used. You put P for parallel or N for newspaper (the program's name for snaking) in the second column and left bracket and right bracket ([ ]) characters in the margins of the columns you want. Within the document, word wrap works as usual, and Ctrl-F2 ends a column. Neat.

Line and box drawing, another popular option, shows up here as well. It includes the ability to use any typewriter key instead of the graphics characters for drawing. If you want to use boxes, you can speed things up with the Home and End keys to expand a box by stretching, or simply speed up the cursor keys by pressing Alt at the same time.

The screen image shown here is reached via the Alt-F3 (Special Edit Functions) combination. A number of the new features are found here. The document, by the way, is the marvelously inventive tutorial, which is entirely contained within a protected (not savable after edit) document

that you load and learn to edit from as you go along.

Section-numbering and outline functions are supported by the Ctrl-Tab combination. For lower levels of outline, you simply use that keystroke the required number of times to reach the appropriate level. The program does logical checking and will warn you if you go to level 3 without passing through level 2. When you're ready to finalize, you're offered the opportunity to select the numbering style you want or create your own. Subsequent changes will be managed for you by the program, appropriately renumbering and so on.

The same Ctrl-Tab characters are used by the new Table of Contents facility, which permits up to seven levels and allows the specification of fill characters and other edit options.

**SUPER-THESAURUS** Returning to the Special Edit Functions menu, we also find the Thesaurus. This one is exceptional. It contains 40,000 words, like *MultiMate*'s, but the added features demonstrate how inadequate size alone is as a measure. This thesaurus not only gives you synonyms, it provides related words (almost synonyms), antonyms, contrasted words (almost antonyms), and compared words. The manual explains the latter as "see also" words, those which express a related idea that may even be more appropriate. All this explains why it takes two disks to hold it all—the thesaurus must be run from a hard disk. In this *OfficeWriter* is unique—Office Solutions seems to be the only vendor here that feels it is now appropriate to assume that the serious office word processing user has a hard disk. With hard disks so affordable, that's a fair assumption. For people whose main use of a PC is word processing, a hard disk may enhance productivity more than moving from a PC to an AT.

Another entry on the Special Edit Functions screen invokes the hyphenation facility, which may be used on a word or applied to the entire document. Secondary document sort is used for such things as mail-merge lists, and it makes it convenient to use those documents without returning to external products that were used to create them (database managers, and so



### FACT FILE



**OfficeWriter,**  
Version 5.0  
Office Solutions Inc.  
2802 Cobco St.  
Madison, WI 53713  
(608) 274-5047  
List Price: \$495; up-  
grade, \$75. Free if Ver-

sion 4.0 was purchased within 90 days of release.

Requires: 256K RAM, two disk drives, DOS 2.0 or later.

**In Short:** It's easy to see why *OfficeWriter* has made substantial inroads into *MultiMate*'s office market; the package is well thought out, rich in features, and document oriented, a major advantage over *MultiMate*'s page orientation. Not copy protected.

CIRCLE 687 ON READER SERVICE CARD



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\*Based on 16 megabytes of RAM.

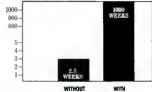
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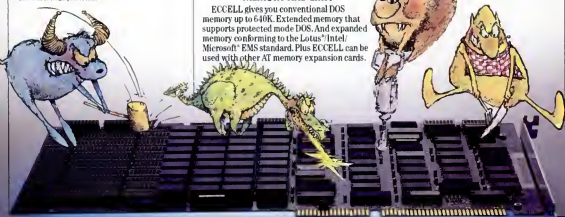
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CIRCLE 492 ON READER SERVICE CARD





## WHAT CONSTITUTES A MAJOR UPGRADE?

**“W**ith each new release we leapfrog our competition,” says Howard Luxenburger, a product manager at Ashton-Tate, “and they do the same to us. If it’s your turn to come out, you can’t let their latest version be out there too long before you respond to it.”

Updates come in two sizes—the little ones that fix problems or make slight improvements, and the big ones whose importance is crowned with an entirely new version number. So exactly what is it that separates the big from the little? “The honest truth is, a lot of these decisions are a little bit arbitrary,” says Dan Lunt, vice president of marketing for *WordPerfect*, whose most recent word processor carries the Version number 4.2. “But for the most part they are based on the extent to which we’ve actually changed the product,” he adds.

Publishers agree in principle that the extent of change is what determines whether a word processor revision merits a whole new version number, instead of

just a decimal increment. “I’m not sure it’s that scientific,” cautions Luxenburger, whose *MultiMate Professional Word Processor*, Version 3.6, has seen its share of upgrades. “To the extent that we do make the distinction, one of the key things is the number and richness of the features that are being added.”

What exactly constitutes a major change? That’s a matter for some speculation, but Luxenburger cites spelling checkers and line-drawing features as past enhancements that stood out. John Hild, president of *XyQuest*, illustrates the point by comparing two releases of his company’s *XyWrite*. “We went from Version 3.0 to 3.1 because we added features. But the features weren’t in and of themselves dramatically different. When we went from version *II Plus* to version *III*, we added things like the ability to open nine windows, and changed some of the user interface as well.”

Clearly, judgment plays a role in assessing the significance of a given

change or group of changes. “You know it when you see it,” Hild continues, “but there is no rule. One man’s treasure is another man’s superfluous accessory, so it’s really difficult to write a rule that is going to place a value judgment on a particular improvement.”

Timing has something to do with the awarding of version numbers as well. Jan Eddy, president of *Office Solutions*, says the company has a definite schedule for the release of major revisions of *OfficeWriter*. “A driving force is that we really want to put out one major release per year,” she says.

While companies may differ on what constitutes minor and major upgrades, they’re more of a single mind when it comes to the cost of upgrades. Decimal revisions generally are a few dollars (in the PC industry, \$25 is a few dollars) that cover the cost of shipping out a new disk and binder. Whole number upgrades are more often in the range of \$50 to \$100.—Jonathan Matzkin

## ■ Multiple columns show up in *OfficeWriter* Version 5.0, with a typically intuitive implementation.

on). Finally, the pagination option is an interesting one because it may be used in an interactive mode, in which case the program prompts you with a suggestion and you respond with appropriate page length, using the cursor keys.

Five-function math (add, subtract, multiply, divide, percentages) is now built in as Shift-F4; it works both vertically and horizontally. Printer support is extended,

as it was in all the other products; here, the new features are extended laser printer support and true microjustification for printers that support it.

A new indexing capability is well thought out. You index a document by creating a secondary one to which words and phrases are copied with a keystroke during document editing or creation. Each entry may be associated with a heading, as well—this permits two-level indexing, for example:

DOGS  
Collies  
Shepherds

The index keywords document may itself be edited—for example, in order to add headings to several items or remove them from others. The headings appear in brackets and can be edited whenever you want to. The ability to chain files is very useful here, as it is with the table of contents feature discussed earlier. With this capability, you can use a separate docu-

ment for, say, each chapter of a book, then chain them together for creating the index, table of contents, and so on.

In the corporate setting, *OfficeWriter* has done a good job targeting *MultiMate*, and the sales it’s taking away aren’t undeserved.

## WordPerfect, Version 4.2

Here’s one of those packages that everyone seems to love. Priced at \$495, *WordPerfect* has consistently won the highest praise from reviewers since its introduction in October 1982, and continues to add to an already rich set of features with every release.

*WordPerfect* calls itself a “document-oriented” product, meaning that page numbers, headers and footers, and so on have to be entered only once, and that there are no artificial boundaries to keep text



began operation by year's end.

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1 See *JanCo Inc. Annual Report, 1985 - 1986*, pp. 12-13.

2 1986-1987 growth and profit projections are detailed on page 17 of this report.

2

Doc 3 Pg 2 Ln 68 Pos 8

PREVIEW

WordPerfect 4.2's new Preview option shows you how the page will look with footnotes (shown here), headers, footers, numbering, and justifications. It does lack true WYSIWYG capabilities, however. Notice that the numbers for the footnotes do not appear in superscript form on-screen.

from flowing between pages. There are many more conveniences here than there are in many other word processing packages; it has one of the finest (and simplest) user interface designs in the field.

The success of this approach has been obvious. Thanks to rave reviews and favorable word of mouth among corporate users, WordPerfect has captured about 30 percent of the market by some estimates, twice that of Microsoft Word or MultiMate. Microsoft and Ashton-Tate have tied their other products to Word and MultiMate as WordPerfect Corp. has done to WordPerfect, MathPlan and the WordPerfect Library have extended the reach of the WordPerfect user by providing a complete environment and synergy, such as easy porting of data and graphics into documents, in a way that neither of its major competitors do.

Version 4.2 of WordPerfect adds a dozen or so enhancements to Version 4.1, which was a major increment over 4.0. So unless 4.2 brings a feature you need and 4.1 or 4.0 lacks, you may not rush right out to get the upgrade released in October 1986. Let's face it, you folks are spoiled.

WordPerfect's F5 key has been put to a couple of new and clever uses. Ctrl-F5 now sports a comments area, which does for word processing what Note-It does for spreadsheets, and SmartNotes for a broad range of programs. You may add comments, which are displayed in boxes on-screen but not printed. The display of these comments may be suppressed, and they may be edited as well. It's marvelous for joint editing of a proposal or manuscript.

Another new option with Ctrl-F5 is the document-summary screen, not unlike MultiMate's but with one big difference—it's optional. If you sometimes want the control, the option is a real boon, and if you're as tired as we are of seeing the summary every time you call a document up in MultiMate, you'll appreciate it even more.

Alt-F5 (Mark Text) adds a Table of Authorities feature for lawyers, who are especially attracted to WordPerfect. This is essentially a two-level index feature that categorizes index entries (Cases, Constitution, Treaties, and so on) and then alphabetizes automatically within each category. You specify the full reference first (the

long form) and then a short version for subsequent marking. The F2 Search capabilities support this very nicely and permit post-composition table generation. You can specify dot leading (....35), underlining of titles and the number of blank lines used as separators.

The final F5 addition is one of the most interesting new features of all—the Concordance. A concordance is a list of words or phrases used as input to the indexing feature to permit additional items to be marked without item-by-item searching. You may use regular indexing as well if you wish. It's a nice added flexibility tool, though slightly less powerful than Office-Writer's.

**PRINT PREVIEW** The Print menu (Shift-F7) has added a new Preview option. This is an early desktop publishing feature (more are expected in Version 5.0), and it shows very graphically how much a bit-mapped-display capability like Microsoft Word's can add to a product. We're not talking about WYSIWYG (What You See Is What You Get) here; this is more like WYSIMOLWYG (WYSI More or Less WYG), because it can't show you fonts, point sizes, or pitches. It will, however, show you how the page will look with its headers, footers, num-



## FACT FILE



**WordPerfect,  
Version 4.2**  
WordPerfect Corp.  
288 West Center  
Orem, UT 84057  
(801) 225-5000

**List Price:** \$495; all-  
grade for 4.1, \$35; all  
other versions, \$60.

**Requires:** 256K RAM, two disk drives,  
DOS 2.0 or later.

**In Short:** A highly successful, document-oriented word processor with one of the industry's richest feature sets. The on-screen environment is very uncluttered but the available help facility is rather exceptional. WordPerfect has a curious need to redefine common industry terms into its own jargon, but once learned, this is no barrier. Not copy protected.

CIRCLE 66 ON READER SERVICE CARD



# Let's talk tips &

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# PC CONNECTION

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## ■ WordPerfect's F5 key has been put to a couple of new and clever uses. Ctrl-F5 now supports a comments area.

bering, justification, and footnotes. You can see the page breaks, of course, and you can select specific pages, as well as the document as a whole. Microsoft would do well to look at this, given the exceptional screen handling of *Word*.

The Shift-F8 key supports the creation of sophisticated multilevel equations without trying to figure out how sub- and superscript are going to work on the exponent that itself got raised to the *n*th power in the denominator. By specifying half-line spacing (assuming your printer supports it) and filling a number of lines with spaces (the manual suggests you save an empty document like this for future use—an excellent suggestion), you can create anything you want in type-over mode without superscripting or subscripting. The space fill is easy in line-draw mode, which supports setting a number of repeats for characters or lines with the Escape key. First you fill a line with spaces, then you create a bunch of those lines. Neat.

The Print Format menu (Ctrl-F8) now lets you number the lines on a document in the left margin. If you're planning on writing a legal document, this may prove useful. You can set the interval used (every second line, every fifth line, and so on), the location of the numbers in the left margin, and whether numbering begins again at 1 on every page.

A number of other minor features, such as increasing the number of columns to 24, were also added.

There is a new tutorial, and it's the biggest disappointment. What WordPerfect has included is well done, attractively presented, and typically excellent in every way. The problem is that there's simply not enough of it. The manual continues to

fairly explode with useful learning material; reference-style material about each feature is followed by a well-designed lesson giving a hands-on example. These should be translated to the on-line format, because they are generally geared to the same example set that is used throughout the rest of the manual anyway.

The changes have resulted in some incompatibilities with Version 4.1, but a conversion facility resolves most of them.

## WordStar, Version 4.0

Four years between upgrades gives the competition an open invitation to court your user base. For any program without the massive popularity of MicroPro International Corp.'s *WordStar* classic, aka *WordStar* 3.30 and 3.31, it could have been fatal.

*WordStar*, Version 4.0, finally surfaced in February; the last major upgrade was *WordStar*, Version 3.3, in April 1983. While the bonds may have weakened for some users in the intervening years, many still believe *WordStar* to be the essential second word processor, the lingua franca that we can all return to for compatibility with each other. Version 4.0

makes a strong bid to recover some of the lost market share by bringing the old standard up to date.

There have been some diversions on the way—the release of *WordStar 2000* for the corporate WP pool and *Easy* for the low end, the departure of key personnel, and ill-fated attempts to extend the "Star" mystique to other products. At bottom, though, this is the bread and butter package for MicroPro. It was serious enough to buy back *NewWord*, an improved *WordStar* clone developed by MicroPro refugees that kept pace with the times, and use it to immediately fill some major holes.

*WordStar* 4.0 costs \$495 list, including *WordStar*, *MailMerge*, and a spelling checker, thesaurus, and indexer (with a \$100 MicroPro rebate and usual street-price discounting, your actual price could be \$150 to \$200), and an \$89 upgrade cost for registered users. Upgrades are handled directly through MicroPro. To make the swap, you need either the serial number of your old program or the reference manual. Call MicroPro at (800) 227-5609 to order the upgrade. If you registered your old version and haven't moved, MicroPro should have sent you an upgrade offer already.

MicroPro claims 125 enhancements in *WordStar* 4.0, including some that aren't in *NewWord*. The menu structure remains the same, although some commands have been changed. Speed has increased; *WordStar* remains among the fastest word processors available.

Path support is *finally* available (it's not so hard to believe it wasn't here before if you remember what release of DOS was current 3 years ago) with the L option on the opening menu. Incredibly, though, there's still no automatic paragraph reformatting. If you change a paragraph, you still have to hit Ctrl-B.

What about the keyboard mapping? The famous ESDX cursor diamond is still there, and extra features have been added for those of us who expect cursor keys to be used for moving the cursor. Accordingly, Ctrl-Left Arrow and Ctrl-Right Arrow move by words, Ctrl-End moves to end of file, Ctrl-Home to beginning of file, and Ctrl-PgUp and Ctrl-PgDn move up and down by lines. PgUp and PgDn by themselves work exactly as you'd expect them to. The Del and Backspace keys are now



### FACT FILE



#### WordStar, Version 4.0

MicroPro International Corp.  
33 San Pablo Ave.  
San Rafael, CA 94903  
(800) 227-5069  
(415) 499-1200

List Price: \$495 (free if you purchased *WordStar* 3.31 after December 1, 1986); LAN version, \$595; LAN nodes, \$150 per workstation; upgrade \$89. Requires: 256K RAM (320K with *Word Finder*), two disk drives or hard disk, DOS 2.0 or higher.

**In Short:** The old standard gets its first upgrade in 46 months. Many New features (undo, macros, and on-screen boldface), being *WordStar* into the 1980s, but some are still lacking, especially automatic paragraph reformatting. Nice improvements, but it's unclear if there's enough magic to win back *WordStar* defectors. Not copy protected.

CIRCLE 684 ON READER SERVICE CARD



set up as you expect with deletion at the cursor and destructive backspace, respectively, rather than destructive and nondestructive backspace, respectively.

From the Ctrl-P print menu, boldfacing and underlining show up on-screen, which means you no longer live in fear of mismatched boldface or underline pairs making the rest of the document print that way when you intended only a single word. Also, the index entry Ctrl-PK entry has replaced Ctrl-PP.

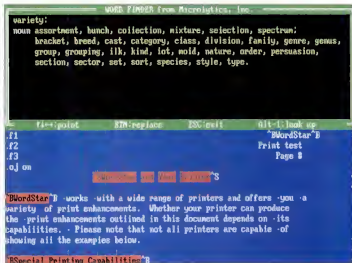
The Ctrl-K Block menu can get you to DOS from within a file with Ctrl-KF, log on to directories as well as disk drives with Ctrl-KL, and Block Read and Block Write column blocks with Ctrl-KN.

By now you've probably noticed that MicroPro opted to retain its generally nonmnemonic control-character conventions, for example, Ctrl-PS to start and stop underlining rather than Ctrl-PU (to MicroPro, it's Ctrl-Underscore). A mid-course correction might prove confusing for loyal users, and newcomers can find the right commands through the on-line help. Tapping J from the opening menu still lets you set the help level, permitting you access to a very clean screen if you so desire and providing help for the opening menu commands. Within any other mode, Ctrl-J followed by a key sequence gives you help on that sequence, for example, Ctrl-JP for help on print-control commands.

Some dot commands were modified, too. Character width can be set for printers with .CW, line height is settable while editing with .LH, and page number can be set while editing as well.

**IMPROVED COMMANDS** With few exceptions, functions in earlier releases perform as expected. There is no data incompatibility, only the occasional command enhancement or change. MicroPro has thoughtfully included a booklet called "What's New" for the existing user base that includes a summary narrative and a table of changes and enhancements.

That table is most impressive when you read through it looking at the commands that are new; they make up the majority of the commands listed. Perhaps nothing will warm your heart as much as the Undo command, which will restore text that you



Microlytics' memory-resident Word Finder, a 220,000-word thesaurus, is included with WordStar, Version 4.0. Word Finder is quick and thorough, and it can be used to look up anything on your screen, WordStar file or not.

have erased, whether you used Ctrl-Y, Ctrl-T, Ctrl-KY, Ctrl-Q Del, Ctrl-QT, or Ctrl-QY. It also interrupts commands in process. Given the lightning speed of the old WordStar compared to its then-competition, it's nice to see that not only does it hold up today, but that advantage has been taken of that speed with a Goto page command (Ctrl-QI) which operates in Document mode. In Nondocument mode, you can Goto a line number.

Macros, here called Shorthand, have been added, with a group of nice utilities. The whole package begins with the Esc key. Although this is perhaps a less-than-optimal choice, given the extensive use of the Ctrl key elsewhere, it's a reasonable approach. An interface to the new calculator function (see below) permits the inclusion of results from its operations, including a formatted number result. If you happen to be in decimal tab mode, the number will be appropriately aligned if your cursor is at the tab position. You can include date and time with Esc-@ or ! and query the existing definitions and create new ones with Esc-?

The calculator, called with Ctrl-QM,

includes 14 math functions, such as log, natural log, arctangent, square root, and the usual basic math. There is a block math feature available, KM, which allows you to sum a column of numbers in a marked block.

If you can afford 320K bytes of RAM, a 220,000 word thesaurus has been included: Microlytics' Word Finder. It's memory resident, and if you wish to use it, about 33K bytes are dedicated to the stay-resident portion. It can be removed from memory with End followed by Ctrl-Home, but that will dump you all the way out to DOS without saving your document. While it's ungraceful, at least you're warned when you try to do it. The command sequence is not that obvious and doesn't appear in the window that comes up when you invoke Word Finder.

Word Finder is quick, thorough, and permits unlimited secondary look-up—point at a word on the first list and look it up, and then repeat as needed, or back up one screen to select a different starting point. The program also can be used to look up anything that is on your screen, WordStar file or not. You would



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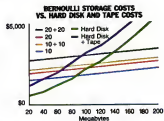
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C O U N T E R P O I N T

## BUT IS IT REALLY WORDSTAR?

*WordStar diehards may find the changes in Version 4.0 too hard to bear.*

There are plenty of things to like about *WordStar*, Version 4.0. What's not to like is that it's not really *WordStar*; it's a slightly improved version of *New-Word*, a *WordStar* clone that didn't exactly set the world on fire in its previous incarnations—primarily because it had serious deficiencies. *WordStar* 4.0 inherits many of these flaws and, like its predecessor, is an amalgam of useful improvements and infuriating degradations.

For openers, Version 4.0, with its screen-wasting rules and clunky function-key display, doesn't even look like classic *WordStar*. Many commands are different, too. For instance Ctrl-KF, which used to get you a directory of the current disk drive, now gets you the DOS prompt: Ctrl-JH, which used to change the help level, now tells you what the Backspace key does. Even Ctrl-Backspace works differently. There are many more discrepancies at least as disconcerting to longtime *WordStar* users. Hand this to a temporary employee, and the result is likely to be temporary befuddlement.

Worse, there's no true equivalent for *WordStar*'s help level 0, in which power users are accustomed to working. Version 4.0's level 0 eliminates all help; there's no way to turn on the status line or even see a file directory. Level 1, however, displays an endless variety of distracting and unnecessary messages.

Still worse, Version 4.0 utterly aban-

dons *WordStar*'s sacred principle that your current cursor position in a document is always visible. Version 4.0 often slaps its screens down and hides your text, producing an awkward "flying blind" feeling unknown in the old *WordStar*. And screen rewriting has become significantly slower in many cases.

Version 4.0 may well be the only major word processor that still doesn't offer automatic paragraph reform. It claims to support proportional spacing, but it's unable to break lines properly for accurate implementation. It still needs *SideKick* to get a second document window. And since the code is different, there's no quick-and-easy way of transferring patches from the thousands of modified copies of *WordStar* to the new version.

For *WordStar* users who'd rather fight than switch, *PC Magazine* editors Paul Somerson and Stephen Manes built an alternative for users who like the current *WordStar* look and feel. These two diehard *WordStar* experts have written a software package called *StarFixer* (published by Bantam) that supercharges *WordStar*, Versions 3.24 and 3.3x, to do many of the tricks performed by Version 4.0—and some the newer product just can't do.

*StarFixer* upgrades classic *WordStar* to double the function keys and performance speed, prevent accidental deletions, fix the Backspace and Del keys to work the way IBM intended, add colors

in unusual places, display 43 lines on an EGA monitor, permanently customize default tab settings, and output fancy boxes and borders on IBM-compatible printers. It counts words, converts files to and from other standard formats, makes it a snap to customize over 100 features, and can even rescue text users who thought they were lost forever after a disk-full or other crash.

*WordStar*, Version 4.0, has unquestionably changed the face of *WordStar*. But for those *WordStar* power users who have long since learned how to fix many of classic *WordStar*'s failings, they may well consider the changes both too much and not enough.—Bill Howard



### FACT FILE



**StarFixer**  
Hard/Soft Inc.  
Box 12773  
Riverside, NY 10471  
(Also available retail from Bantam.)  
List Price: \$29.95 plus \$2 postage.

Requires: 256K RAM, DOS 2.0 or later, *WordStar* 3.24 or 3.3x.

**In Short:** A powerful set of software enhancements and upgrades for current *WordStar* users who'd rather fight than switch. Not copy protected.

CIRCLE 676 ON READER SERVICE CARD

certainly want to test before using it with any other package (it locked up *Multi-Mate*), and of course there's the "load me first" routine to be gone through with any other TSR (terminate-but-stay-resident) programs you may have.

Line and box drawing, another of today's big favorites, is included with Alt combinations of the function keys. At present, only the single line set is included. Other extended characters are accessed with the Alt key and the numeric keypad; if

your printer supports them, they'll be printed as they appear. Printer support has been improved with the addition of the Laserjet B and F proportional cartridges and sheet-feeder support with the .BN command. Proportional spacing may be toggled on and off with the new .PS command. Headers and footers of up to three lines may be added with the .Hn and .Fn command where n is from 1 to 3.

Function keys are now used if you prefer one-key versions of the commands. A

two-line display shows the unshifted and shifted versions of the keys on-screen in edit mode. A keyboard overlay shows all four sets (using Alt- and Ctrl- as well.) You can reprogram all 40 of these keys through WSCCHANGE, a well-designed "create your own patches" program that saves you all the DEBUG-based boxes that so many of us came to know and love during the old days. Most settings, from color to defaults, are now adjustable through WSCCHANGE.

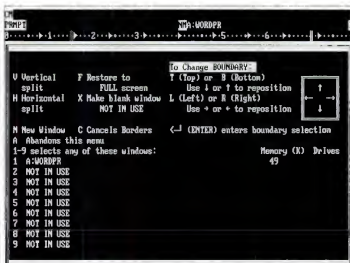


There is much more, but the bottom line is this—*WordStar* is back. If you loved it, you still will, and more than ever. If you have moved on to other products, it's worth another look. If you've never been a *WordStar* user but you're in the market for a serious, full-function package, check this one out.

## XyWrite III, Version 3.1

Long the darling of reviewers, XyQuest's *XyWrite*, first introduced in September, 1982 has enjoyed an enviable reputation among the cognoscenti as the ultimate professional word processor.

For the new user, the best news is that the documentation gets better and better and the tutorial is a joy. For the power user, *XyWrite III*, Version 3.1's litany of new and enhanced features over both *XyWrite II Plus* and *XyWrite III* looks like a Christmas list. The blazing speed remains; *XyWrite* has always been fully memory resident and that tradition continues. Nine windows are supported, and the moving and copying of blocks between windows is done through a menu—even less "power"-ful users can handle that. Search and replace can be used across multiple files, and the column mode may be requested af-



You use the menu above to move between *XyWrite III*, Version 3.1's nine windows and use the function keys to copy and move blocks of text to them. You can also search and replace across files and use the column mode after text has been generated in full-screen fashion.

ter text has been generated in the usual full-screen fashion—to make it a little easier on the eyes.

Version 3.1, priced at \$395, was announced in October 1986 and added a surprisingly large number of enhancements. XyQuest seems to have identified the desktop publishing marketplace as a critical area in which to maintain its dominance. So many professional writers make use of *XyWrite*'s ability to generate pure ASCII files, which can be handed directly to a typesetter, that staying ahead of the pack here virtually assures continuing preeminence for *XyWrite*.

There are several general areas of new features and upgraded capabilities. Access to DOS and the external environment is one that is particularly interesting. It is surprising that such a high-powered product didn't have full path support until now, but it's been done in great style. Not only can you specify the drive you want temporary files to be put on, you can keep the location of a file you're editing in another directory plainly in view, and when you store it, it will automatically be put into the correct directory.

The copying and renaming of files is now possible without exiting to DOS, though you can't use wildcards. However, a little magic can be very helpful here: simply change directory first into the target directory; take a directory of the one you wish to copy from; then judiciously use the Copy command and the F9 (Execute command) key to cursor your way through the directory for a poor man's full-screen file-handling utility.

Combining files is one of those awkward things you have to do sometimes, usually with the extended syntax of the DOS COPY command. Not with *XyWrite*; the new Append command will combine files for you without opening them. As for erasing, you can now have a message prompting you for confirmation if you choose to use the Erase command within the editor. Locating files has been made easier through a number of new and extended features as well. The new Dirl command (for long directories) adds the first few lines of the file to help you make sense of it all, and options allow you to set how many lines you see, as well as whether the output should be "packed," that is, shown



## FACT FILE



*XyWrite III*,  
Version 3.1

XyQuest Inc.,  
P.O. Box 372  
Bedford, MA 01730  
(617) 275-4439

List Price: \$395; up-  
grade from *III*, \$35; from  
*II Plus*, \$100; from *II*, \$200. Free upgrade if  
*XyWrite III* was purchased after September 1,  
1986.

Requires: 256K RAM, two disk drives,  
DOS 2.0 or later.

In Short: The dean of professional pack-  
ages, *XyWrite III* is a very powerful, light-  
ning-fast, command-driven package. It has  
the most extensive desktop publishing capa-  
bilities in this group. Not copy protected.

CIRCLE 685 (READER SERVICE CARD)



## ■ WORD PROCESSING SOFTWARE

without the carriage returns (very useful for correspondence, in which the first few lines may just be spacing).

A Tree command gives you a visual display of your subdirectory structure; if that still doesn't help, a Find command searches the entire volume for you. The Find command does accept wildcards, and the Tree command may be used as a point-and-shoot utility by putting a Dir, CD, or Rmdir command on the command line and using cursor position and F9 to get at what you need.

Access to date and time through *XyWrite* is possible through the Now and Today commands, which insert current values permanently into the text. The embedded background print utility (Type) will now accept up to five page ranges, which you can print while you continue to edit the file (if you opt to set things up to create PRINT.TMP for you). The print capabilities permit queuing of documents; Kityp has been extended with the Q argument, which will empty the queue. You can specify offsets separately for odd and even pages, which is a godsend for documents expected to be bound or three-hole punched.

**FOOTNOTING CAPABILITIES** How about document control? Well, the range of capabilities here is astonishing and unmatched. Footnote capabilities have been stretched to permit up to three independent sets of footnotes, with user-defined symbols (or none at all) and different formats, if needed. Here the odd and even page differences would have been particularly useful. They are not yet supported.

Page-numbering style is now an option, as well as a new FP command (Final Page), which allows you to print a header or footer in the format "Page 2 of 16" without knowing in advance how many pages will finally be in the document. This kind of variability in document preparation is central to a number of the more-interesting features. A case in point is the Reference commands, which allow you to label text to be referred to later, as in "See Chapter 5, page 19." One label suffices for later references to chapter, section, and page, all governed by separate commands. Section is user-definable; it doesn't have to be called Section if some other organiza-

tional unit is preferable. Another example of variable labeling is the automatic numbering features themselves. Including section numbers in running headers and footers is variable while the document is being edited as well. Better still, if you like to create separate documents for different chapters that have subdivisions that are numbered, but you want to chain-print them, the number references can be made conditional, so that they will be ignored when included in a larger print chain but displayed if that document is handled alone.

Indexing and table-of-contents capabilities are showing up in many of these products now, but *XyWrite*'s have a wealth of sophisticated features. For example, multilevel indexing is supported, and you can request an automatic insertion of a break between letters in the index, with the displayed letter format made variable. Multiple references and duplicate references to the same page are handled automatically, and the final index line will show all references to a topic in order. The sort order of the index and the table of contents themselves are customizable. You can even use references to other entries (for example, "VP-Planner—see Lotus Clones"). If you wish, the numbers can appear in chapter-number format.

All the formatting commands are inserted into the document at the place where they take effect. They show up as deltas, or filled-in triangles, that take up single-character spaces on-screen and can be expanded with Ctrl-F9 to show the contents.

**DESKTOP PUBLISHING** Version 3.1 expands the desktop publishing capabilities *XyWrite* has long pioneered. A little background: leading refers to extra spaces inserted by typesetters to make things balance properly. You've seen its analog in proportional spacing and microjustification, in which extra spaces are inserted to give you aligned right margins instead of ragged right.

Leading has its place in the vertical dimension as well. No doubt you've noticed that in professionally typeset documents the lines are sometimes farther apart to accommodate a few larger font characters in the middle of a line or that paragraphs may be set apart by an amount that doesn't

## ■ Version 3.1 expands the desktop publishing capabilities *XyWrite* has long pioneered.

seem to be an integer multiple of line depth. This is line leading, and the LL command in *XyWrite* supports it. How significant is this? Even dot matrix printers have pretty sophisticated, though often unused, vertical-spacing abilities, and laser printers like the HP Laserjet can support vertical movement on the order of 1/32 of an inch! Best of all, the AL (automatic leading) command lets you mix in larger letters within your document without getting that crowded look: the line above will be the minimum distance required away from the highest point on that line.

Are there things missing? Absolutely. We'd love to see what *XyQuest* could do with an integral spelling checker. And while *XyWrite III*, Version 3.1, is somewhat friendlier with TSR (terminate-and-stay resident) programs like *SideKick* or *ProKey* than were previous versions, it's still a weak point.

Because it has such heavy penetration among writers and editors and they talk about what they like (it's been the official word processor at *PC Magazine* for more than 2 years), *XyWrite* seems to be a bigger player in the market than it really is. Still, *XyWrite III* is a force to be reckoned with right now.

Compared to *Microsoft Word*, *XyWrite III* is much faster and has an exceptional range of bells and whistles. *Word* does a better job of repetitively formatting documents through its style sheets and showing on-screen what your printout will look like.

## CONCLUSIONS

These products are the state of the art at the top of the list. There are interesting personality differences among them. Some programs are enthusiastically promoted by

(continues)



# PSION<sup>TM</sup> ORGANISER II<sup>TM</sup>

The PC That Fits in Your Pocket



Lotus<sup>TM</sup> 1-2-3<sup>TM</sup> Compatible\*

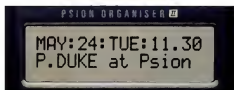


# EVERYTHING YOU NEED TO KNOW...



## IT'S AN INDEXED FILING CABINET...

Personal and business information is cross-referenced to answer questions such as "Which restaurants do I know in San Francisco?", "What cars do we stock wiper blades for?" or "Which of my cassettes are by Beethoven?". Customer and stock records, suppliers lists, book catalogues and any other reference information can be stored and entries selected quickly and easily on particular criteria.



## IT'S A DIARY THAT REMINDS YOU...

You can record appointments in a ready-made diary by date and time, not just for the current year but for future years too. Like any other diary, you can browse through the entries, or go straight to a specific date. Unlike an ordinary diary, Psion Organiser II can be set to turn itself on and beep you up to an hour before an appointment—and show you who, where and when on the screen.



## IT'S 8 REGULAR ALARM CLOCKS...

You can set up to eight alarms to ring at any time during the day or week. The alarms can be programmed to ring at weekly, daily or hourly intervals as you wish—for example, for morning calls or regular weekly appointments.

## SUMMARY SPECIFICATIONS—SOFTWARE

### GENERAL MENUS

Functions selected from menu using cursor.  
The main menu can be rearranged and user-created items added.

### DATA STORAGE DEVICES PERIPHERALS MEMORY RETENTION

Internal (A), Datapaks (B, C - optional)  
Connected through top port (D)

Internal - Indefinite with battery or AC adaptor  
connected, two minutes allowed for battery change.  
Datapaks - Indefinite. Can be removed without loss of data.

### MAIN MENU FILING SAVE

FIND, SAVE, DIARY, CALC, PROG, ERASE,  
ALARM, TIME, INFO, COPY, RESET, OFF

### FIND

Saves records on data storage devices (Datapaks, Internal). Entries can be edited, and are automatically scrolled if longer than 16 characters. Maximum 255 characters and 16 lines per record.  
Finds records which match given search text.  
Repeated key presses list records one by one. Record on screen can be edited and resaved.  
Finds records as FIND. Prompt to confirm deletion.  
Copies data files from one data storage device to another.  
Information on memory usage/availability.  
0.5 second average for 32K of data.

### ERASE COPY

### INFO ACCESS TIME



# PLUGS INTO OFFICE SYSTEMS



Psion Organiser II has a standard peripheral port at the top of the machine to allow a wide variety of devices to be attached for communications and specialized applications. Once the peripheral has been connected, additional commands which access the codes from the peripheral are activated automatically within Organiser II.

The portable Organiser II is expanded into a complete system simply by plugging in the optional **COMMS-LINK** interface and cable and connecting it to printers, computers and modems equipped with the industry standard RS232 port. Records and files can be transferred in either direction, from the Organiser to the printer, computer or modem and from the computer or modem to the Organiser. The communications software allows for error-free transmission of files through telephone lines via a modem. This system enables Psion Organiser II to be used as a portable database, holding information from a central computer or for collecting and transferring data to other systems. It can also communicate with messaging services such as **Compuserve®** to access the telex network, for example. Moreover, you can print, send or receive information from the OPL programming language.

In addition, the top port accepts other standard Psion peripherals such as the Bar Code Reader and Magnetic Card Reader. See the specifications box below, or contact Psion for more information on specialist peripherals and how Psion Organiser II can be customized for very large-scale corporate applications.



## SUMMARY SPECIFICATIONS—STANDARD PERIPHERALS

### COMMS-LINK

Plugs directly into top port of Organiser II and includes interface, cable, and Organiser II software.

Menu-driven software directly controls printers and provides asynchronous communications to other computers and modems which have an RS232 serial port. Allows bi-directional transfer of files, OPL programs and spreadsheets between Organiser and PC. Provides access to electronic mail and telex services. Communications can be controlled by OPL programs.

For use with IBM® PC, XT®, AT® and compatibles, a 5¼" disk is provided with extra software. For communications to other PCs any standard communications package will suffice.

Provides RTS/CTS, XON/XOFF handshaking and XMODEM error-checking protocols. Baud rates 50-9600.

### AC ADAPTOR

AC adaptor that connects to Organiser's top slot for desk-top use, provides power in parallel to battery — does not charge battery — and preserves the Organiser RAM memory during connection. Power 110-118 volts, 50-60 Hz for USA, 220-240 volts, 50-60Hz for Europe.

### BARCODE READER

Auto discriminates between UPC, CODE 39, 2 in 5 interleaved, EAN8 and EAN13. Includes Organiser II interface, high-level software and digital switched wand. Introduces command **BAR\$** into OPL language, which returns value of barcode scan.

### MAGNETIC CARD READER

Track two card reader to ISO 3554. Includes cable, Organiser interface and high-level software. Introduces command **SWIPE\$** into OPL language, which returns as a string the data from track two of the card. Durable for in excess of 300,000 passes.



# PSION ORGANISER II

© 1987 PSION, LTD.

## PRODUCT SUMMARY

### PSION ORGANISER II - MODEL CM

32K ROM, with built-in diary, filing, calculator, clock and alarm functions. OPL programming language. Internal 8K RAM for your personal filing, diary appointments and programs. Optional Datapaks up to 64K each, the Comms-Link, program packs and the AC adaptor can be connected and used.

### PSION ORGANISER II - MODEL XP

All the functions and capabilities of Model CM with four times the internal memory (32K RAM) for your data are standard with Model XP. Additionally the XP allows optional 128K Datapaks, Barcode Readers and Magnetic Card Readers to be connected and used.

### DATAPAKS

Datapaks perform a role similar to floppy disks on desk top computers and up to two Datapaks plug directly into the back of Psion Organiser II. The use of Datapaks adds considerably to the power of Psion Organiser II by freeing internal memory for diary entries and programs, and for the secure, battery independent storage and back-up of your personal information.

### SOFTWARE PACKS

These packs contain pre-written permanently recorded software programs for specialized applications and plug in just like Datapaks. They are supplied with a comprehensive manual to enable you to use the programs for your own specific needs. Some examples are:

**The Finance Pack:** for financial calculations, personal bank account and expense account management.

**The Maths Pack:** solves analytical mathematical functions and provides statistical analysis.

**The Concise Oxford™ Spelling Checker:** look up the spelling of 24,000 words.

**The Spreadsheet Pack:** a full-function spreadsheet, 26 columns x 99 rows. Operates independently or, using the Comms-Link, can exchange spreadsheets with a PC. Generally compatible with Lotus™ 1-2-3™ and additionally accepts DIF format worksheets.

### COMMS-LINK

This is used to connect Psion Organiser II to printers, computers and modems equipped with the industry standard RS232 port. Comms-Link is supplied with a plug wired for the IBM PC and XT. Plug adaptors for other computers and printers are available. Additionally for use with IBM PC, XT and AT and compatibles a 5 1/4" disk is provided with extra communication software. For communication to other PCs most standard Comms packages will suffice.

### CORPORATE PRODUCTS

For prices and supply of the Bar Code Reader, Magnetic Card Reader, Copier 8, Eraser 16 and the Applications Development System, please contact Psion.

Psion reserves the right to change product range and technical specification without prior notice.

## SUMMARY SPECIFICATIONS - HARDWARE

### DIMENSIONS

Length 5.6", Width 3.0", Depth 1.1"  
(with protective sliding case closed).  
8.8 ozs. (without battery).

### WEIGHT

### PROCESSOR

8-bit CMOS 6303X 80 pin surface-mounted (6800 family). Clock speed 1 MHz.

### DISPLAY

2-line x 16 characters, dot matrix LCD. Provides a 78-character set from keyboard, 8 graphic user-defined characters. Total of 232 characters accessible using built-in OPL programming language.

### KEYBOARD

36 multifunction keys provide 26 upper and lower case alpha keys, 10 numeric, 16 operator and punctuation keys and 4 cursor keys. Audio 'click' and tactile mobile feedback. Auto-repeat after 1 second continuous depression.

### INTERNAL MEMORY

ROM: 32K containing operating system, OPL language and applications software. RAM: 32K (model XP) 8K (model CM) CMOS used for personal data storage, diary appointments and programs. 1K can store 1,024 characters.

### MASS-STORAGE DRIVES

2 "solid-state drives" built-in, which take Datapaks or program packs (Datapaks with software recorded on them).

### MASS-STORAGE DATAPAKS

Datapaks are solid-state plug-in memory units. Maximum capacity 128K (model XP) and 64K (model CM). Up to two can be present in Organiser II at the same time. Datapaks consist of Read/Write Eeprom with an access speed of 100K/sec. Available with capacities 16K, 32K, 64K and 128K.

### INTERFACE

16-pin slot on top of Organiser II accepts the COMMS-LINK interface to give RS232 communications at up to 9,600 baud, the AC adaptor, the Barcode Reader interface and Magnetic Card Reader interface. Also capable of parallel communications up to 100K/sec.

### AUDIO

Sound capability of 11Hz to 10KHz frequency, with 1 msec to 30 seconds duration, under software control from OPL.

### POWER

Standard nine-volt long-life alkaline battery will give 2-6 months life typically. Optional external AC adaptor available. Power consumption varies from 50 micro amps to 100 MA depending on operating mode.

### DURABILITY

Gold-plated contacts. Protective sliding case.

### OPERATING TEMP

32-122°F

\* See Owner's Manual for spreadsheet specifications.

"Lotus" and "1-2-3" are trademarks of Lotus Development Corp. Psion

is not in any way affiliated with Lotus Development Corp.

"Concise Oxford" is a trademark of Oxford University Press.

"IBM", "XT" and "AT" are trademarks of International Business

Machines Corp.

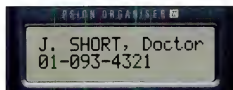
Compuserve is a registered trademark of Compuserve Incorporated.

"Psion" and "Organiser II" are trademarks of Psion, Ltd.





# IN THE PALM OF YOUR HAND



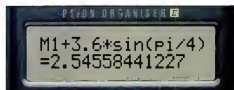
## IT'S A PERSONAL SECRETARY...

Pison Organiser II will store all your vital personal information, such as names, addresses, telephone numbers and business contacts. Just type in a small detail as a clue and the powerful built-in cross-referencing system will recall the item you require in less than a second and automatically scroll it across the screen.



## IT'S A CLOCK AND CALENDAR...

Pison Organiser II has a built-in clock showing week-day, date, month, year, hours, minutes and seconds. And you can change the battery without losing the settings. The clock also monitors and controls the alarm and diary functions.



## IT'S A CLEVER CALCULATOR...

Pison Organiser II does calculations what calculators did to the slide rule. Calculations are displayed on the screen as they are performed, so that entries can be checked and changed if you want to carry out several similar ("What-If") calculations. It has twelve-digit calculation accuracy, ten memories and full mathematical and scientific functions. The number of decimal places required in the answer can be set at any level from 0 to 12.



## IT'S ADAPTABLE...

Pison Organiser II contains an extremely powerful but easy-to-use programming language (OPL) allowing simple and sophisticated programs to be written to meet your own or your company's particular requirements. The programs can be stored either in the built-in memory, or on an optional Datapak, for repeated use later. OPL's many functions include accessing and processing data on up to 96 files held in the machine or on each Datapak.

## ARE (STANDARD IN ROM)

### DIARY DISPLAY

Tabular form: Days horizontally, 1/2 hour appointment slots vertically. One time slot displayed on screen. Move around diary with cursor keys. View and set entries. Automatic year scrolling for perpetual diary up to 1999.

### LIST SEARCH

List appointments chronologically. GOTO day and time. FIND entry with given search text.

### ALARM

Reminder alarm set 0-59 minutes before appointments.

### TIDY FILES

Block-erase entries to clock date. SAVE and RESTORE diary file from data storage devices. DIRECTORY of diary files.

### TIME/ALARM

### CLOCK CALENDAR ALARM

Hours, minutes, seconds.  
Year, month, date, day.  
Up to 8 Alarms may be pre-set, each with weekly, daily or hourly repeat.

### CALCULATOR

### ACCURACY OPERATORS FUNCTIONS

To 12 digits.  
+, -, /, \*, \*\*, Any number of brackets.  
50 mathematical, scientific and user-programmed functions.

### MEMORY EDITOR DISPLAY RESULT

10 store (+, -, overwrite) and recall.  
Editable, "What-if" facility.  
User-definable from 0-12 decimal places.

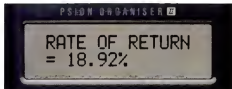


## AND IT TELLS YOU ABOUT ITSELF...

A status report is available at any time on the amount of data and diary information currently in the machine and on Datapaks, and the quantity of internal memory still free.



# PLUG IN EXTRA PROGRAMS



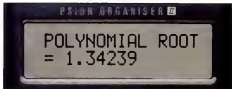
## IT'S A FINANCIAL ANALYST...

Psion Organiser II is built to run plug-in applications programs. For example, the **Finance Pack**, in addition to all the normal financial calculations like IRR, discounted cash flows, interest calculations, annuities and mortgage repayments, allows you to record, monitor and analyze your expenses and payments as they are incurred. Each item is automatically dated and logged for later analysis and printing.



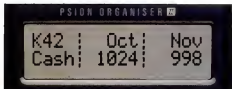
## IT'S A BANK MANAGER

The **Bank Account** facility within the Finance Pack allows you to record bank transactions as they take place and provides you with a detailed bank record and current balance at all times. Standing Orders are automatically applied on the correct day each month. Comprehensive bank statements can be printed out and particular transactions can be traced simply by keying in the date, item or amount.



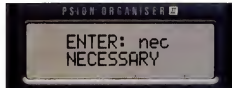
## IT'S A MATHEMATICIAN...

Solve Bessel functions, polynomial equations, quadratics, the solution of matrices, Eigenvalues, integration under a curve, as well as more standard statistics calculations, correlation coefficients, confidence levels, "Chi-squared" and more with the optional plug-in **Maths Pack**.



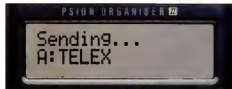
## IT'S A PORTABLE SPREADSHEET...

The **Spreadsheet Pack** puts a full-function spreadsheet that is compatible with Lotus™ 1-2-3™\* in the palm of your hand. Ideal for performing both simple and complex calculations, the Spreadsheet is 26 columns by 99 rows and accepts Lotus™ 1-2-3™\* worksheets directly from your PC. Whether created on your Organiser II or downloaded from a PC, just imagine your budgets and financial planning spreadsheets in your pocket for instant reference wherever you go.



## IT'S A REFERENCE LIBRARY...

With the huge amounts of memory available on Psion Organiser II you can at last have electronic reference books at your fingertips. Check your spelling, for example, with the **Concise Oxford™ Spelling Checker**. Just type in the first few letters to define the word and Psion Organiser II will display the correct spelling on the second line of the screen. Many such reference applications will be released shortly.



## IT'S A COMMUNICATOR...

Your Psion Organiser II "talks" to the world of printers, computers and telecommunications devices with the sophisticated **COMMS-LINK**. Transfer data files or programs from a desk-bound PC into Organiser II for portable reference, connect to printers and send or receive electronic mail or telex services with a modem. Download Lotus™ 1-2-3™\* worksheets or DIF format files to the Organiser II Spreadsheet.



# IT'S A COMPUTER... ...DESIGNED FOR A THOUSAND APPLICATIONS

The trouble with computers is that they are of no use to anyone. By themselves. But with software, they will solve thousands of problems. So the useful computers are those which are designed to run software applications.

**That is why we have built the features of a desk-top PC in probably the most powerful hand-held computer yet devised...up to 320K of on-board memory...ready-to-use software built-in...powerful programming facilities for your own specific needs...extra plug-in program packs..."solid-state drives" to store information and load programs...plug-in peripherals and links to office-bound systems...all for a mere fraction of the price of a desk-top computer.**

Rugged, reliable and battery powered, it can be carried in your pocket to be used whenever and wherever you are. You need no computer experience, since **Organiser II** comes with built-in menu-driven programs. And that's just the start. You can program **Psion Organiser II** for your particular need by using the built-in OPL programming language and run "off-the-shelf" software by plugging in optional program packs. Programs can be saved for later repeated use and the

most frequently used can even be inserted on the main menu for quick and easy access.

Just like a desk-top computer, **Psion Organiser II** has the equivalent of two disk drives — two thumb-sized slots in the back of the machine. Into these are plugged the equivalent of disks, tiny solid-state memory units called "Datapaks". These perform the function of disks and provide unlimited mass storage of data and programs, but are not so vulnerable to wear and tear and thus provide exceptional security for your data. Datapaks require no power backup and thus keep your information safe even when removed from the **Organiser II**.

**Psion Organiser II** incorporates that other hallmark of the true computer system—the ability to communicate. Through a slot in the top of **Organiser II** it can simply be connected to printers, other computers and telecommunications devices, opening up the whole world of electronic data transfer to **Organiser II**.

With its Datapaks fitting flush inside the **Organiser II** body and within the sliding protective case, **Psion Organiser II** is the most powerful, complete and compact computer system that fits in your hand.

## 256K OF SOLID-STATE "DISKS"

The key to the open-ended power and utility of **Psion Organiser II** is the invention of "solid-state disks" — tiny thumb-sized memory units with huge storage capacity, called Datapaks. These perform the same functions as disks on conventional desk-bound PC systems, and provide unlimited mass storage of data and programs. Unlike disks, they consist of solid-state memory and thus are not vulnerable to wear and tear, and are small enough to fit flush inside the **Psion Organiser II** body.

Datapaks retain their information even when removed from the **Organiser**, and can be used to store and recall both programs and data. Datapaks can be erased in the **Psion Organiser Eraser**, and are available in sizes from 16K (with capacity for 16,000 alpha-numeric characters) up to a massive 128K (model CM limited to maximum capacity 64K Datapaks).

Thus you can plug in up to 256K of "disk" storage into your **Psion Organiser II** at any one time, and build up an unlimited library of Datapaks.





# EASILY PROGRAMMED

Built into Psion Organiser II is an extremely powerful operating system and programming language (OPL) designed to enable individuals and companies to find solutions to their specific problems. Psion Organiser II offers the power and flexibility for any needs from simple programs for everyday use to complex applications such as stock movement and credit card control. Organiser II is supplied with a comprehensive manual to enable both novices and experts alike to develop their own programs quickly and easily.

The high-level, structured programming language built into the ROM of the Organiser is essentially drawn from BASIC but developed further using modern structured programming concepts. Procedure-based, the language is designed to be easy, comprehensive and very fast. For example, the first 100 prime numbers can be obtained three times faster than the same procedure written in BASICA on an IBM® PC. It includes integer handling, real arithmetic, variables and string and numeric arrays.

To enhance Psion Organiser II's already impressive data handling capabilities, the language includes full database facilities which allow the creation of files, the

definition of fields and records, the searching and locating of records and so on. This makes Organiser II's programming language a powerful data processing and fully featured database handling language. These facilities also allow complete software control of the screen, keyboard, peripherals and three devices (internal memory, two Datapak devices).

Psion Organiser II's operating system is soft, so that the main menu can be rearranged or functions added or deleted as desired. Applications can be called or booted from the Datapak drive. Entries to machine code are also allowed. The operating system supports a wide range of peripherals through the top port of Organiser II.

The programming language is supported in Organiser II by an editor program, LOAD and SAVE and the cataloging of programs. Programs can be written with these aides directly on Organiser II, tested, debugged and run within the machine. In addition, for very large applications, Psion provides an emulator running on an IBM® PC, XT® or AT® so that the program, once written, tested and debugged, can be downloaded to Organiser II.

## SUMMARY SPECIFICATIONS—OPL PROGRAMMING LANGUAGE

### LANGUAGE

PROCEDURE BASED, BASIC-LIKE, EXTENSIBLE

### CONSTRUCTS

IF, ELSEIF, ELSE, ENDIF  
DO, UNTIL  
WHILE, ENDWH  
BREAK/CONTINUE  
GOTO

### VARIABLES

EXTENT Local, global, single and arrays  
TYPE Real, integer, string, fields

### COMMANDS

AT *i,j* Position on two-line screen.  
BEEP *i* BEEP with *i* duration, *j* period.  
CLS Clears the display.  
CURSOR *i* Sets cursor mark.  
EDIT *a\$* Edit a string.  
ESCAPE ON/OFF Allows/Denies user to break into program.  
INPUT *i/x/a\$* Input an integer/number/text string.  
KSTAT *i* Set keyboard status.  
ONERR LABEL Goto label on error.  
ONERR OFF Turns Organiser II off.  
OFF Turns off error protection.  
PAUSE *i* Wait in 50 millisecond units.  
POKEB/W *a,j* Poke *j* at address *a*.  
PRINT *a\$,i,x* Print numbers or strings.  
LPRINT *a\$,i,x* Print to a printer.  
RAISE *i* Generate an error condition.  
RAND *x* Seed the random number generator.  
REM Remark statement.  
RETURN *i/x/a\$* Return *i/x/a\$* to calling procedure.  
STOP Exit from the language.  
TRAP Trap errors on the next command.

### FILE HANDLING

APPEND Append a record.  
COPY Copies a file or files.  
CREATE Creates a file.  
DELETE Deletes a file.  
ERASE Erases a record.  
FIRST/LAST/ NEXT/BACK Gets the first/last/next/previous record.

### OPEN/CLOSE

Opens/closes a file. Up to 4 files can be open at a time.  
Selects a record by number.  
Rename a file.  
Update a record.  
Change files.

### FUNCTIONS

FIND(*a\$*) Finds record containing string *a\$*.  
DATIM\$(*s*) Date-time string.  
FREE Returns free memory in bytes.  
COUNT Returns the number of records in a file.  
POS Returns the correct record number.  
SPACE Returns free space on the device.  
DIR\$(*a\$*) Returns file name.  
FIX\$(*x,i,j*) Returns *x* as a fixed point decimal number.  
GEN\$(*x,i*) Returns *x* in the best fit format.  
NUM\$(*x,i*) Returns *x* as an integer.  
SCI\$(*x,i*) Returns *x* in scientific format.  
ERR Returns the last error number.  
ERR\$(*i*) Returns the error string associated with an error number.  
DISP(*i,a\$*) Display a record.  
MENU(*i,a\$*) Provides a menu option.  
VIEW(*i,a\$*) Displays a scrolling string on the screen.

### ADDITIONAL FUNCTIONS

SECOND, MINUTE, HOUR, DAY, MONTH, YEAR  
ABS(*x*), ATAN(*x*), COS(*x*), DEG(*x*), EXP(*x*),  
FLT(*x*), IABS(*x*), INT(*x*), INT\$(*x*), RND(*x*),  
LN(*x*), LOG(*x*), PI, RAD(*x*), SIN(*x*), SQRT(*x*),  
TAN(*x*)  
GET, GET\$, KEY, KEY\$  
ASC(*a\$*), CHR\$(*i*), HEX\$(*i*), LEN(*a\$*),  
LOC(*a\$,i*), LOWER\$(*a\$*), UPPER\$(*a\$*),  
VAL(*a\$*)  
LEFT\$(*a\$,i*), MID\$(*a\$,i,j*), RIGHT\$(*a\$,i*),  
REPT\$(*a\$,i*)  
ADDR(*i/x/a\$*), USR(*i,j*), USR\$(*i,j*), PEEK(*i*),  
PEEKW(*i*)  
EOF, EXIST(*a\$*), RECSIZ.



## ■ WORD PROCESSING SOFTWARE



### Word Processing Programs: Summary of Features

(Products listed in ascending price order)

	XyWrite III, Version 3.3 XyQuest Inc.	Microsoft Word, Version 3.1 Microsoft Corp.	DisplayWrite 4, Version 1.0 IBM Corp.	OfficeWriter, Version 5.0 Office Solutions Inc.	WordPerfect, Version 4.2 WordPerfect Corp.	WordStar, 4.0 MicroPro International Corp.	MultiMate Professional Word Processor, Version 3.5 Multimate International Corp.
List price	\$395	\$450	\$495	\$495	\$495	\$495 (single user)	\$595
Upgrade price	\$35	\$25	\$45	\$75	\$35	\$89	\$60
Parallel column printing	●	○	●	●	●	○	●
Snaking column printing	●	●	○	●	●	○	●
Chain printing	●	●	○	●	○	●	○
On-line thesaurus	○	○	○	○	●	○	○
Table of contents	○	○	○	○	○	○	○
Indexing	○	●	○	○	○	○	○

- — Yes, in previous and current version  
 ○ — Yes, in current version only  
 — — No

**A**ll the easy capabilities have been built in, and now high-end word processors are playing a game of leapfrog with new, more-exciting features. Selected examples include multiple columns (par-

allel) is like a movie script; snaking is like a newspaper), chain printing, thesaurus, table of contents, and indexing. Upgrade price is the cost of upgrading from the previous version.

their producers for their strongest features such as XyWrite III's continuing "power user" feel or DisplayWrite 4's effortless screens, while others seem unsure how to promote their products' strengths, as with Microsoft Word and its style sheets.

Of the old standbys, only XyWrite III seems intent on continuing a breakneck pace of feature enhancement. This is, of course, part and parcel of the product's approach anyway: a power-user tool with high-powered publishing capabilities. As more and more publishing capabilities are available at the printer end these days, it's wise for XyWrite to extend its lead.

MultiMate Professional Word Processor, on the other hand, has seen its market share erode under the attack of upstarts like OfficeWriter and WordPerfect. This may be due in part to an unwillingness to truly evolve the product. Few users would ask for a continuing-page orientation, for example. Ashton-Tate reportedly is hard at work on a major upgrade, abandoning plans for a minicomputer version. The upgrade has to include document-oriented features if MultiMate plans to stick around as a major player.

■ **Microsoft Word** has held onto its base; the power of its bit-mapped screen, the ease of its menus, and the quality of its laser printer output have helped.

WordPerfect, flush with recent success, has taken a momentary pause in its headlong rush of new features long enough to add the WordPerfect Library, which provides a whole host of convenience features to word processor users, and has brought to market a mainframe version of its product. Continued success is likely, as it is for the emerging OfficeWriter—both at MultiMate's expense.

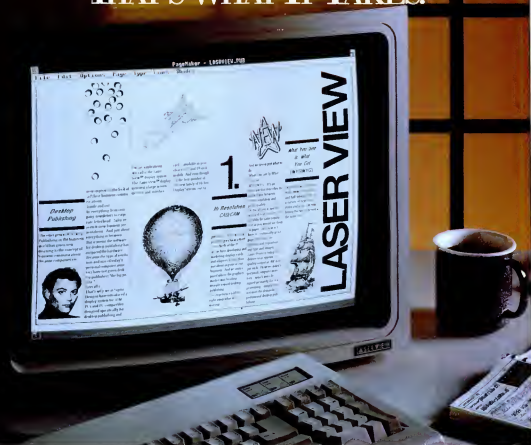
Microsoft Word has held onto its base; the power of its bit-mapped screen, the ease of its menus, and the quality of its laser printer output have helped. Still, there are problems—no support for Windows, half-hearted support of style sheets, and sluggishness on anything south of an 8-MHz AT. Here, too, you can expect a major upgrade (Word 4.0) in the next few months.

DisplayWrite 4 has markedly improved its interface since Version 3, and the depth of features is impressive. The principal limitation is the usual one: IBM doesn't recognize the outside world, and so support for other products and printers is limited as usual. However, the ongoing integration of the IBM product line is evident here as well; exchanging documents in a connected world (if it's mostly blue) becomes a great deal simpler with this version.

Merv Adrian is project manager at a major New York brokerage firm and chairman of the NY PC User Group's micro-to-mainframe SIG group. His book on micro-to-mainframe transfer will be published by McGraw-Hill in December 1987.



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# FOUR-FIGURE VIDEO



The term *high-resolution graphics* has about as much meaning as "lots of memory" or "a big hard disk." What we mean by these things changes almost monthly. When IBM first came out with the PC, it used the words *high resolution* to describe the 640- by 200-pixel graphics mode of the Color/Graphics Adapter. Nobody really objected at the time. Since then, the 720 by 348 resolution of the Hercules Graphics Card and the 640 by 350 resolution of the Enhanced Graphics Adapter have become commonplace.

More recently, several manufacturers of EGA-compatible boards (Video-7, Tseng Labs, and STB) have reached out and touched the 640 by 480 mark. (See "Stretching the Standard: Seven New EGA Boards," *PC Magazine*, Volume 6 Number 1, for reviews of the Video-7 and Tseng Labs boards.)

A 640- by 480-pixel resolution has held a certain magic ever since IBM released the Professional Graphics Controller (PGC) and Display back in the fall of 1984, about the same time as the EGA was released. While quite expensive for general-purpose use (\$2,995 for the board and \$1,295 for the display), the PGC's 256-color output (from a palette of 4,096) and high-level graphics command language have gotten much support from the CAD (computer-aided design) field.

But 640 by 480 is only the beginning—and not just for the CAD community. We are now on the threshold of a revolution in video technology that will bring authentically high-resolution graphics video adapters and large displays to the desks of general-purpose PC us-

*Good news for resolution junkies: video displays can now produce images with over a million pixels. A discussion of the latest technology, possible applications, and the sometimes-outrageous prices precedes our reviews of the ten products currently available.*





## ■ FOUR-FIGURE VIDEO

ers, at a fraction of what such technology costs today.

Just as you can predict that within a couple of years the computer on your desk will have a faster CPU, lots more memory, and a bigger hard disk, rest assured that you will be looking at a video screen that displays well over a million dots.

**FOUR-FIGURE VIDEO** In these reviews we'll look at ten video boards and their accompanying displays in which either horizontal or vertical resolution is 1,000 pixels or more. That's what we mean by "four-figure video."

This criterion is based more on technology than on application. The result is a mixed bag of products. Several of these boards are obviously for CAD workstations. Others seem more appropriate for word processing or desktop publishing. A few do color (which the CAD community likes), but most are monochrome. Some can emulate a common Monochrome or Color/Graphics Adapter. Others require that they be installed as a secondary display system on a PC already equipped with a normal video board.

Of course, the term *four-figure video* has another meaning, and that's the cost. Only one of the board-and-monitor combinations reviewed here sells for under \$1,000, and this single exception lists for \$999. The highest-priced board and display combination reviewed in this article lists for nearly \$7,000.

While spending thousands of dollars for a video board may sound reasonable if you're doing engineering design, it's a little ridiculous if you're running 1-2-3, particularly if the board can't even run 1-2-3, as many of them can't.

But the forthcoming video revolution will change all this—we're going to see much lower prices for higher resolution and much greater software support. Let's first examine why this technology is so expensive now and why it's not going to remain that way for long.

One of the common ideals of a high-resolution display is a 1,024 by 1,024 monochrome display. Such a display contains over a million pixels.

In terms of memory, this is not too bad—each pixel requires one bit of memory, so the memory requirements are just

128K. But getting the contents of this memory out to the display is a problem.

Many of the displays run at a vertical-scan frequency of about 60 Hz—that is, the entire display is refreshed 60 times a second. (Some boards and displays use an interlaced display in which half the scan lines are alternately displayed every 60th of a second, and the full screen is refreshed 30 times a second. This sometimes causes a slight flickering effect and is less desirable than noninterlaced displays.)

If a video board must shoot 1 million

■ You can rest assured that within a couple of years you will be looking at a video screen that displays well over a million dots.

pixels out to the display every 60th of a second, the dot clock of the video board has the awesome task of running at 60 MHz. At 60 MHz, engineers must abandon the simple TTL (transistor-to-transistor logic) chips that serve so well in most parts of the machine and start using cranky ECL (emitter-coupled logic) chips.

Now let's go for some color. Sixteen colors are nice, but 256 colors are even better. We need more memory for this. The 1-bit-per-pixel memory required of a monochrome display now becomes 1-byte-per-pixel, and we're now up to 1 megabyte of memory required for the video display. It's getting easier to fit a megabyte of memory on a video board, but how is the computer going to handle all of it?

**THE STRAIN ON THE PC** We now have a problem with the interface between the computer and the video board. The 1 megabyte of memory required for a 1,024 by 1,024 resolution 256-color board is the same size as the entire address space of the PC's and XT's 8088 and the AT's 80286 running in real mode.

So, either the memory display buffer of the video board has to be bank-switched within a smaller region of the PC's memory, or it's got to be taken out of the PC's address space entirely and accessed through other means.

Either way, a million bytes becomes a lot of memory for even an 80286 to manage adequately. Under a simple bank-switched memory-mapped video scheme, the 80286 would have to copy a million bytes to the video board just to clear the screen.

In comparison, the Color/Graphics Adapter has 16K bytes and the Hercules Graphics Card has 32K bytes of memory. That's certainly easier to work with than a megabyte. The megabyte of display memory cries out for a totally different solution.

The solution is to take the problem of writing to enormous amounts of display memory out of the hands of the microprocessor running the rest of the computer and give it to a dedicated graphics processor located on the video board.

Let's give this graphics processor the ability to recognize commands and to modify the display memory appropriately. For instance, software in the main computer can simply give the graphics processor a command ("Draw a blue line between this point and that point" or "Fill this circle with green") and the graphics processor does the necessary calculations and alters the buffer memory.

In fact, the video buffer memory does not even have to be accessible from the computer. If the commands recognized by the graphics processor are rich enough, the graphics processor becomes a high-level drawing tool that frees up the main computer for more-interesting jobs.

IBM's Professional Graphics Controller (PGC) is one graphics processor solution that has become something of a standard, to the point of being imitated by other video board manufacturers.

The PGC is a three-board sandwich that takes up two slots in an XT or AT. To aid in the task of translating commands into modified video memory, it has its own 8088 microprocessor running at 10 MHz. The board has 320K bytes of memory for the display buffer, and 64K of ROM and 2K of RAM for the 8088.

The commands that may be sent to the



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## ■ FOUR-FIGURE VIDEO

PGC can be expressed in either ASCII or binary form. The PGC has support for both two-dimensional and three-dimensional drawing. Three-dimensional drawing capability makes it particularly appropriate for CAD applications.

The resolution of the PGC is 640 by 480 with 256 simultaneous colors selectable from a palette of 4,096. The number of colors displayable simultaneously depends on the amount of memory available for the display buffer. Two hundred fifty-six colors require eight color planes, each of which must have 640 times 480 bits.

The total number of colors (4,096) is a result of using an analog output rather than a digital output. The digital or TTL outputs of the CGA and EGA use digital color signals that are either on or off. The CGA has four color signals and can display 16 possible colors. The EGA has six color signals and can display 64 possible colors. An analog output such as that used for the PGC usually has three color signals for red, green, and blue. Each of these signals may be varied between a minimum and maximum value. In the PGC, each color signal may be set to 16 different values, for a total of 4,096 combinations. Each of the 256 colors defined by the video memory passes through a "color lookup table" to be converted to one of the 4,096 colors that can actually be displayed.

**THE SINGLE-CHIP SOLUTION** Of course, a three-board sandwich that takes up two slots in an XT or AT is not the way to make an inexpensive video board that can find its way to the desks of PC users who use general business software. The way to do this is to put the graphics processor into a single chip.

Three of the big names in chips—Intel, Texas Instruments, and Hitachi—all have developed sophisticated single-chip graphics processors that represent a new generation in video. These graphics processors are the Intel 82786, the TI 34010, and the Hitachi 63484.

The Hitachi 63484 is already used in the Monitorm Viking I board reviewed below. At the most recent Comdex computer exposition in November 1986, several manufacturers showed off prototypes of graphics boards developed around the Intel and TI chips. At the time of this writing,

however, not one of them was available for review.

Already people are placing bets on who will win the graphics processor market battle. To sum up the arguments and preliminary verdict, it looks like Intel's superior market position and clout (it is the developer of the 8086 microprocessor family used in the PC and compatibles) may not be adequate to counter the sheer superiority of the TI chip. At this point, the Hitachi chip is simply failing to garner sufficient market interest.

## ■ Windows looks pretty on an Enhanced Graphics Adapter and color monitor, but stunning when blown up to four-figure video size.

Of course, we've just begun. *PC Magazine* will have much more to say about these graphics processor chips—and the boards—as they become available.

One wonders, though, if the people talking about a "winner" in the graphics processor battles are too mired in the current mindset concerning standards and compatibility. Perhaps they feel that the market can tolerate only one graphics processor standard. After all, they might point out, the history of the PC has seen many, many graphics video boards but only three real standards—the IBM CGA, the IBM EGA, and the Hercules Graphics Card. How can the PC market support two or three very different graphics processors?

The fallacy in this argument is that although all video boards based around the TI 34010 may be similar from the perspective of software, they will certainly not be identical. Nor will all boards based around the Intel 82786. Each manufacturer will be taking a different approach to using the chips—with monochrome, TTL color, and analog color boards of many different resolutions becoming available.

No single video board manufacturer is big enough to establish a standard that everybody else will follow religiously. It won't be like the IBM EGA, which dozens of manufacturers have attempted to mimic exactly, even duplicating IBM's bugs and the "IBM" signature in the BIOS copy-right notice. The EGA marked the last time that we will witness a phenomenon of this sort in the video board market.

From here on, manufacturers strike out on their own, freed from the compatibility gridlock that until now has severely inhibited innovation and confident that the market will judge their product based on its strengths rather than the extent to which they've duplicated the bugs and quirks of somebody else's product.

Who will win the graphics processor battle? Everybody. Most of all, the user.

But how can this be? Who changed the rules?

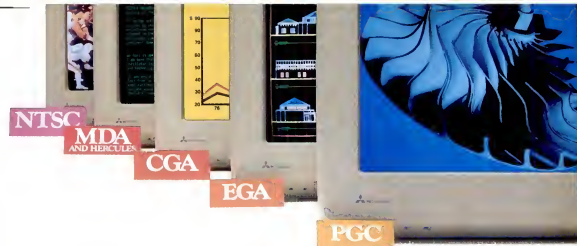
**THE WINDOWS FACTOR** *Microsoft Windows* is the crucial software bridge that will let general-purpose PC users choose from a vast and varied market of inexpensive high-resolution video hardware without any concern about compatibility problems.

These video boards will all be sold with a floppy disk that contains a *Windows* driver. After installing *Windows* with this driver, any software program written to run under *Windows* will work fine with the new video board, taking advantage of both the board's higher resolution and additional colors.

Programs developed for *Windows* use the graphics display through *Windows'* Graphics Device Interface (GDI). The GDI puts a device-independent layer between the applications program and the actual hardware. Applications programs need not be concerned about how the particular video board works. That's the job of *Windows* and the particular display driver. Programmers of *Windows* applications are very sensitive to the needs of "device-independent" programming and work very hard to get it right.

Of course, the emergence of *Windows* as a widely accepted and widely used operating environment on the PC is certainly not obvious right now. Although sales of *Windows* have been good, most of it is un-





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## Graphic Board Compatibility\*

- |  |   |
|--|---|
| <input type="checkbox"/> Orchid Turbo PGA        | <input type="checkbox"/> VMI PGA                          |
| <input type="checkbox"/> Orchid Turbo EGA        | <input type="checkbox"/> Persyst BoB/16                   |
| <input type="checkbox"/> Sigma Designs Color 400 | <input type="checkbox"/> Hercules                         |
| <input type="checkbox"/> Video 7 Vega-Deluxe     | <input type="checkbox"/> IBM PGC, EGA, CGA                |
| <input type="checkbox"/> Integraph Plus 4        | <input type="checkbox"/> AST Research AST-3G/Model 1      |
| <input type="checkbox"/> Paradise Auto SW EGA    | <input type="checkbox"/> ATI Graphics Solution/EGA Wonder |

\*Partial List Only

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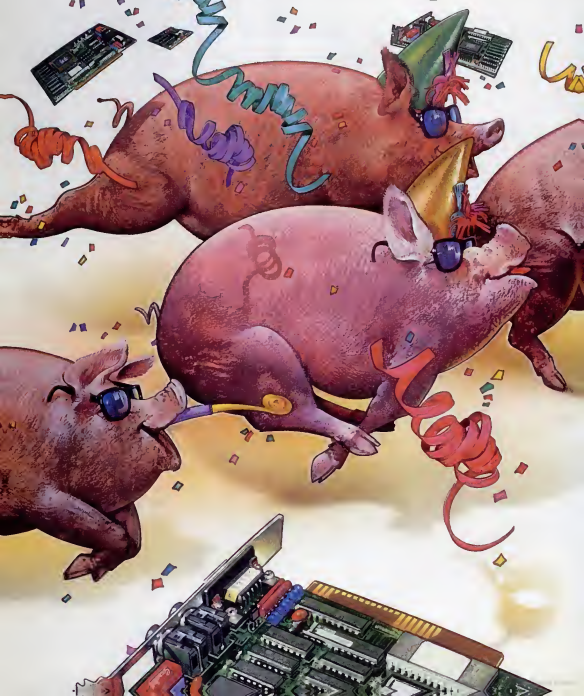
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# Critics Go Hog Wild





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And that was before we introduced the **Autoswitch EGA 480 Card** with 132 column mode, 480 vertical line resolution, and extended our already unbeatable range of software applications support.

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## ■ FOUR-FIGURE VIDEO

doubtedly shelfware. The current catalog of *Windows*-specific software from third-party software developers is still very small.

The interest in *Windows* among software manufacturers, however, is gaining. During this year, we will see spreadsheets, word processing, desktop publishing, and business graphics software that run under *Windows*. By the end of 1987, *Windows* will be a viable environment in which to spend your PC hours. By the end of 1988, you may have forgotten what the DOS prompt looked like.

*Windows* and high-resolution video fuel each other. *Windows* looks ugly in the black-and-white mode of the Color/Graphics Adapter, pretty on an Enhanced Graphics Adapter and color monitor, and stunning when blown up to four-figure video size.

The video board manufacturers have certainly realized the importance of *Windows* in making their boards useful to a market much wider than the CAD field. To manufacturers currently developing high-resolution graphics boards based on advanced graphics processors, the concurrent development of a *Windows* driver is of very high priority. This single driver will guarantee support of the many varied programs now being written for *Windows*. It's that simple.

This is not to say that every PC application is suitable for *Windows*. While the *Windows* GDI interface certainly provides enough functionality for many common applications, some applications will be better off continuing to drive the graphics board themselves.

Strangely enough, the applications least appropriate for *Windows* are probably the CAD programs that currently have the biggest need for high-resolution video.

For instance, *Windows* currently defines no three-dimensional drawing functions, so a *Windows* CAD program would have to do all the three-dimensional calculations and translation in software, even if *Windows* happened to be driving a graphics processor that supported three-dimensional vectors. Similarly, *Windows* defines no rotational translations, so even if *Windows* were driving a graphics processor that supported rotational translations, *Windows* applications would not be able to



### High-Resolution Displays: Summary of Features

(Products listed in ascending price order)

	List price	Highest horizontal resolution (pixels)	Highest vertical resolution (pixels)	No. of simultaneous colors
<b>WY-700</b> Wyse Technology	\$999*	1,280	800	B&W only
<b>LaserView</b> Sigma Designs	\$1,150	1,664	1,200	4 shades of gray
<b>GDP VIVA 1000/Macan</b> GDP Computer Systems Inc.	\$1,295	1,000	800	16
<b>ConoVision 2800</b> Conographic Corp.	\$1,325	2,880	1,024	B&W only
<b>Genius VHR<sup>2</sup></b> Micro Display Systems Inc.	\$1,795*	728	1,008	B&W only
<b>GDP VIVA 1000/16</b> GDP Computer Systems Inc.	\$1,995	1,024	1,024	16
<b>Viking 1</b> Monitem Corp.	\$2,395*	1,280	960	B&W only
<b>Vectrix Pepe</b> Vectrix Corp.	\$2,750	1,024	1,024	16
<b>Image Manager 1024</b> Vermont Microsystems Inc.	\$3,495	1,024	800	256
<b>Matrox PG-1280A</b> Matrox Electronic Systems Ltd.	\$3,995	1,280	1,024	256

\* Price includes monitor. <sup>1</sup> Model 402

use them. All of the video mapping modes available under *Windows* use signed 16-bit integers for coordinate values. CAD packages often use floating point.

Likewise, not all video boards are appropriate for *Windows* either. The PGC has a fine command set for CAD programs. But *Windows* can't take advantage of much of its power and needs certain essential functions that the PGC simply doesn't have.

But for more-common business applications, you'll find that the current graphics interface and drawing abilities of *Windows* are just fine. Moreover, the new generation of graphics processor chips are more suited (but still very far from ideal) to the special requirements of an efficient *Windows* display driver.

Already there is some talk—mostly from people who want it rather than those who have to build it—of a graphics processor chip designed specifically for *Windows*, essentially a *Windows* display driver on a chip.

*Windows* will give the business user the opportunity to start enjoying the many advantages of working in a graphics environment with a large high-resolution display. The graphics processors will bring the cost down. A system composed of an AT, a high-resolution video adapter, a large screen, and *Windows* is no longer just a PC as we know it today—it's actually a high-powered multitasking workstation. And we're going to find that workstations aren't just for engineers—they're for business people too.





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## ■ FOUR-FIGURE VIDEO

### THE CALM BEFORE THE STORM

But that's the future—the direction that high-resolution video will take in the next 2 years. We can get some idea of the treats we'll enjoy by looking at what is available right now.

This, then, is the state of high-resolution video *before* the revolution.

—Charles Petzold

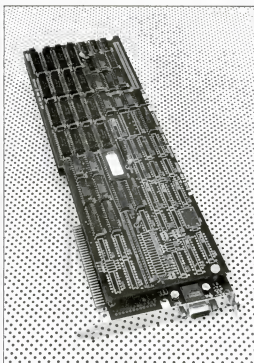
### CONOGRAPHIC CORP.

#### ConoVision 2800

The ConoVision 2800 graphics system, from Conographic Corp., gives a near-optimum combination of compatibility and high resolution. When you turn your system on, the ConoVision 2800 looks to your PC like an ordinary, plain vanilla Hercules-compatible monochrome graphics adapter. But when operated by a program with the proper software driver, it's capable of on-screen resolution up to 2,880 by 1,024 pixels.

The combined monitor-and-video-adaptor system is based on an HD68B45P CRT controller, which is a refinement of the 6845 that forms the basis of the lesser standard PC display adapters (IBM monochrome, CGA, and Hercules Graphics Card). On-board display memory totals 512K bytes, which is bank-switched into the normal IBM video memory map locations starting at B0000 (hexadecimal) in either 64K- or 32K-byte pages (software selectable).

Transfers of video information directly



■ The ConoVision 2800 can transfer video information directly to the display at high speed because its on-board display memory, which totals 512K bytes, is bank-switched into the normal IBM video memory map locations starting at B0000 (hexadecimal) in either 64K or 32K pages (software selectable).



to the display can thus be accomplished at the highest possible speed. Proper video updating nevertheless requires a fast microprocessor—either an AT or an XT equipped with an accelerator board.

The ConoVision video board is controlled entirely through input and output instructions directly to its I/O ports. While the ports used in the system's compatibility modes are mapped to the same locations as used by the 6845 on an ordinary monochrome card, an extra pair of ports and extended set of control registers are provided for special ConoVision modes.

In its native graphics modes, the ConoVision system supports three horizontal on-screen resolutions—2,880, 1,440, or 720 dots (or in multiples of 640, by software-selecting a second on-board clock)—with a vertical resolution of 720 or 1,024.

The video RAM actually encompasses a wider-ranging raster, up to 4K by 1K in

highest-resolution mode. The displayed dots are shown as a window into the video information in memory. Through software commands, the window can be panned through memory and zoomed-in for greater magnification.

The two highest resolutions support only black and white; at 1,440 horizontal dots, an additional brightness level is available. At low resolution, a four-tier gray scale can be used.

The ConoVision video board also supports character-oriented alphanumeric modes with two built-in character sets. Each character can be assigned attributes (blinking, high intensity, underline, reverse video), as with the IBM monochrome display scheme. All of the memory on the ConoVision board is usable for text displays, arranged as either 80- or 256-column lines with up to 1,024 rows of 80 columns available.

The ConoVision 2800 display is actual-



### FACT FILE

#### ConoVision 2800

Conographic Corp.

17841 Fitch

Irvine, CA 92714

(714) 474-1188

List Prices: Board, \$1,325; monitor \$1,525;

Raster Image Processor option, \$660

Requires: AT, or XT with accelerator or expanded memory.

In Short: A big-screen, super-high-resolution (2,880 by 1,024) monochrome (white on black) display system that's also Hercules and IBM Monochrome compatible.

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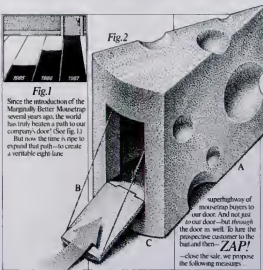
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Fig. 2



Page 1

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**CIRCLE 480 ON READER SERVICE CARD**



## ■ FOUR-FIGURE VIDEO

by a relabeled Monitorm VY-1000, a non-interlaced display that uses white phosphors in a tube with a medium-gray background that is not antiglare treated. In Hercules-compatible mode, the 19-inch (diagonal) display gives large enough characters that you can throw away your bifocals—almost 1/4 inch tall. In high-resolution mode, it allows the display of two side-by-side, life-size, what-you-see-is-what-you-get pages of electronic-publishing-style text with readable characters (up close) all the way down to 6 point.

Conographic also offers an optional Raster Image Processor (RIP) that dumps the video memory of the display system directly into a Canon-engine-based laser printer, allowing full-page graphics text to be printed at the mechanism's top speed of 8 pages per minute. There's no wait for image processing inside the printer because only the ConoVision memory (which holds about one-third of a page) is used. While an AT is fast enough to refresh this memory as the page prints, hard-copy output with an XT is limited by processor speed. In addition, this RIP system can be made to effectively double the vertical resolution of the Canon engine to 600 by 300 dots per inch.

Although the product is currently documented only for developers—and scantily at that—drivers for *Windows* and *Ventura Publisher* came with it. The system is so well thought out, however, that essentially you plug it in and it works. Not only is its big screen and high resolution a balm for the myopics among us, but it may be the best desktop publishing display currently available. —Winn L. Rosch

### MATROX ELECTRONIC SYSTEMS LTD.

#### Matrox PG-1280A

The Matrox PG-1280A, from Matrox Electronic Systems, is a three-board sandwich that requires two AT slots. It looks suspiciously like an IBM Professional Graphics Controller compatible. It is but it isn't—this board has some major improvements.

The horizontal resolution is 1,280, or double the PGC's, and the vertical resolution can be either 960 (double the PGC's

480) or 1,024. The analog output can display 256 simultaneous colors from a palette of 4,096 (like the PGC) or (optionally)



#### FACT FILE

##### Matrox PG-1280A

Matrox Electronic Systems Ltd  
1055 St. Regis Blvd  
Dorval, Quebec  
Canada H9P 2T4  
(514) 685-2630

List Price: Adapter, \$3,995, Mitsubishi FG6000 15-inch color monitor, \$2,795.

Requires: AT or compatible.

In Short: A PGC compatible with double the resolution in both directions, the Matrox PG-1280A can also run with software that expects a normal PGC. It is fast and adds some commands to the PGC command set.

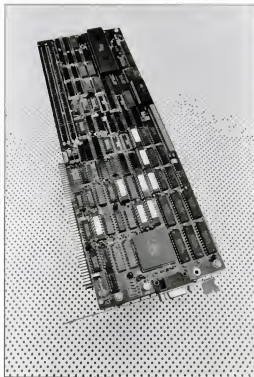
CIRCLE 600 ON READER SERVICE CARD

a palette of 16.8 million. Like the PGC, the PG-1280A includes Color/Graphics emulation logic, so you can use the board without any other video board in your system. You can turn the emulation off if you want to use a separate CGA.

The PG-1280A can emulate the normal IBM PGC (or a PGC compatible, such as the Matrox PG-640) by mapping the 640 by 480 resolution to the 1,280 by 960 display. Each pixel coming from software is translated to a rectangular group of 4 displayable pixels. Thus, the PG-1280A can run software configured for a PGC and still use the entire screen (but with a perceived 640 by 480 resolution). Considering the widespread CAD support of the PGC, this is a very nice feature.

The PG-1280A command set is compatible with the IBM Professional Graphics Controller but again adds a few needed

(continues)



■ The Matrox PG-1280A is a three-board sandwich that requires two AT slots. While it looks very much like an IBM Professional Graphics Controller compatible, it doubles the PGC's horizontal and vertical resolution, adds to the command set, and offers speed advantages over the PGC.





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#### NEC



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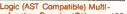


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1. Follow instructions on the other side

Back

001515Back-0018



Inverted Back

1. Follow instructions on the other side



# Foldout slip-sheet

004515Sheet-001



## Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with
1. Front side touching the free page
2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



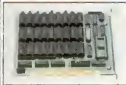






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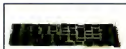
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450 WT ..... 369  
675 WT ..... 549  
1000 WT ..... 819



## ■ FOUR-FIGURE VIDEO

improvements. The additional commands include bit block transfers, either from one area of the screen to another, from system memory to display memory, or from display memory to system memory. These last two operations use a DMA (direct memory access) channel of the AT for maximum speed.

The PG-1280A has some other definite speed advantages over the PGC as well. The 16-bit AT bus certainly helps. Rather than the 8-MHz 8088 on the PGC, the PG-1280A has an unidentified processor with 16-bit external and 32-bit internal architecture.

The PG-1280A manual is rough on the eyes, but it provides a good introduction to the programming of the PGC. It contains full documentation of the PGC command set in the same format that IBM used in its PGC Technical Reference manual.

Supplied software includes diagnostics, configuration, utility programs, an interactive program to issue PGC commands to the board from the keyboard or a file, a VDI driver, and some demo programs.

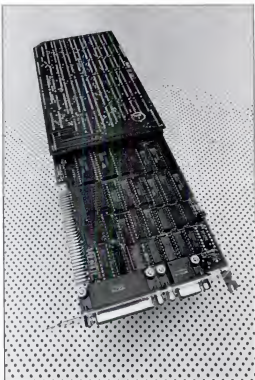
—Charles Petzold

### MICRO DISPLAY SYSTEMS INC.

## Genius VHR

Everybody who sees the 15-inch portrait-sized black-and-white display of Micro Display Systems' Genius VHR knows exactly what it's for—displaying a whole page of text on one screen. The resolution of 728 by 1,008 allows an 80-column by 66-line text on a 7½- by 10-inch display area. Many popular word processing programs can be patched or configured to use this text mode. In graphics mode, Micro Display Systems' board is ideal for desktop publishing software running under *Windows* or *GEM*.

To the PC and PC software, the Genius VHR board looks like a normal monochrome adapter and is installed like one. (It even includes a parallel printer port.) With a version of ANSI.SYS and an easy setup utility included with the Genius VHR, you can use the 66-line mode right in DOS. It's a real thrill to see a DIR listing from DOS in 66-line chunks. The characters are small but very readable.



■ To the PC and PC software, Micro Display Systems' Genius VHR board looks like a normal monochrome adapter and is installed like one. It even includes a parallel printer port.



## FACT FILE

**Genius VHR**  
Micro Display Systems Inc.  
1310 Vermillion St.  
P.O. Box 455  
Hastings, MN 55033  
(800) 328-9524  
(612) 437-2233

**List Price:** Includes adapter and monitor.  
Model 402, \$1,795; Model 401 (text mode only, upgradeable), \$1,595.

**Requires:** PC, XT, or AT.

**In Short:** To software, the Genius usually looks like a big monochrome display. To you, it looks like 66 lines of text. In graphics mode, it can run *Windows* in 728 by 1,008 resolution. The Genius is ideal for desktop publishing or simple word processing.

CIRCLE 89 ON READER SERVICE CARD

The Genius VHR documentation includes methods for using the 66-line text-mode display with programs such as *WordPerfect*, *Spellbinder*, *XyWrite Plus*, *WordStar 2000*, *WordStar*, *Volkswriter*, Lotus's *Symphony* and *1-2-3*, and Borland's *Turbo Pascal*, *SuperKey*, and *Turbo Lightning*. Often these require DEBUG patches, but for some programs it's just a matter of telling the program to use 66 lines. The text-mode display buffer simply continues where the normal monochrome buffer ends.

The Genius VHR can also emulate a 25-line monochrome display on the top half of the screen and a CGA graphics display on the bottom half of the screen. While this configuration may sound a little odd, it's ideal to use separate monochrome and CGA boards for 1-2-3. Both the spreadsheet and the graph can then be dis-



## ■ FOUR-FIGURE VIDEO

played in different areas of the same screen.

The native 728 by 1,008 graphics mode of the Genius VHR is memory-mapped in two 64K-byte blocks starting at A0000 and B0000. The graphics display can be overlaid with text at the normal monochrome text address starting at B0000. This video mode of the Genius VHR cannot be used in a machine that also contains a CGA (where it would conflict with the CGA video memory) or an EGA (where it would conflict with the video memory and the ROM BIOS).

The included graphics software comes with drivers for *Halo DPE*, *Windows*, and *GEM*. (*Windows*, Version 1.03, also includes a Genius driver on the distribution disks.) With *Windows*, you get almost three times as much vertical display area as with an EGA. You can stack three windows on top of each other and still have ample room in each.

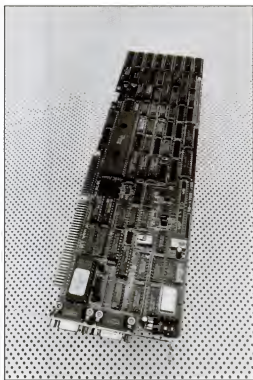
Of all the boards and monitors reviewed here, this is the one that right now makes the most sense for general-purpose PC use, particularly for word processing or desktop publishing applications. Programming documentation is included.

—Charles Petzold

### MONITERM CORP.

#### Viking 1

Moniterm Corp.'s Viking 1 (reviewed previously in *PC Magazine*, Volume 5 Number 22) is a single board with an AT bus connector that may be installed in a PC,



■ Moniterm's Viking 1 is a single board with an AT bus connector and may be installed in a PC, XT, or RT. The board contains 512K bytes of memory and a 64-pin Hitachi HD63484 Advanced CRT Controller.

XT, or RT. The single board has 512K bytes of memory and is dominated by the massive 64-pin Hitachi HD63484 Advanced CRT Controller.

The Viking 1 board and Moniterm Corp.'s 19-inch white-phosphor monochrome display are sold together. The 1,280 by 960 resolution of the board spreads out quite nicely on this giant screen. It's a real beauty.

Although it's easiest to install the Viking 1 as a secondary display system, you can run your current CGA, monochrome, or Hercules Graphics Card into the Viking 1. It converts the video signal back to digital form and then converts that into it's own video signal that it can display on the screen.

Software includes interactive diagnostics with source code that serves to document the workings of the board. (Video memory is not mapped to PC memory;

control of the board is through I/O ports.) Moniterm also supplies an AutoCAD ADI-type driver, some experimental drivers for I-2-3 with a 142-column by 43-line text display, and a *Windows* driver.

Moniterm recently improved its *Windows* driver for the Viking 1. It now takes advantage of some of the graphics processing of the Hitachi controller and shows definite speed improvement over the old driver, particularly in patterned fills.

Moniterm has also obtained (from Bitstream) a new, very crisp, 12 by 16 "system font" for *Windows*. (The system font is the default font that *Windows* uses for most normal text, for instance, the directory listing in the MS-DOS Executive.) This new font makes the screen eminently more readable, although you get less displayable text than with the EGA 8 by 12 font that Moniterm used previously. Even with the new font, though, you can still get a nice-



### FACT FILE

#### Viking 1

Moniterm Corp.  
5740 Green Circle Dr.  
Minnetonka, MN 55343  
(612) 935-4151

List Price: Includes board and monitor, \$2,395.

Requires: PC, XT, or AT.

In Short: Very popular as a high-resolution monochrome board for *Windows*, the Viking 1 also has drivers for AutoCAD and I-2-3. A new *Windows* driver works very well.

CIRCLE 606 ON READER SERVICE CARD



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Multi-Scan  
super high resolution  
TTL/Analog  
color monitor.

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#### Price

Mfr's List: **\$799**

#### Display

Band Width: 30 MHz  
Frequency: Autocan  
15.5 KHz  
to 35 KHz

Resolution: 800 x 500  
Signal: TTL/Analog

#### Picture

Non-glare 14" CRT  
Dot pitch: 0.31mm



### CASPER TE-5154

#### Price

Mfr's List: **\$699**

#### Display

Band Width: 25 MHz, 14" CRT  
Mode 1: 64 colors, 720 x 350  
Mode 2: 16 colors, 720 x 200



### CASPER HP-14

#### Price

Mfr's List: **\$249**

#### Display

14" flat screen, Monochrome  
High resolution, 1000 x 350  
Mode 18.43 KHz

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#### Display

14" Color  
640 x 240  
High resolution



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#### Price

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#### Display

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1000 x 350  
High resolution

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CIRCLE 221 ON READER SERVICE CARD



## ■ FOUR-FIGURE VIDEO

size 100-column by 56-line display in *Windows*' Notepad. The only problem with the new font is that exclamation points look like little roadside crosses.

The more you use *Windows* on this 19-inch monitor, the more you start to feel that perhaps \$2,395 is not so unreasonable for a display system of this caliber.

—Charles Petzold

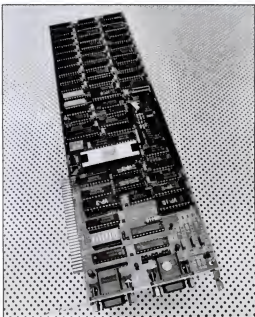
### QDP COMPUTER SYSTEMS INC.

## QDP VIVA 1000/Mscan QDP VIVA 1000/16

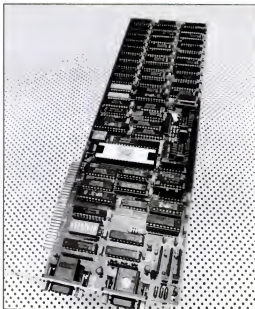
The QDP VIVA 1000/Mscan and QDP VIVA 1000/16 high-resolution color graphics controllers are very similar boards, and, in fact, the former can be upgraded to the latter.

The VIVA 1000/Mscan displays 16 colors in a resolution of 1,000 by 600. It has a TTL (transistor-to-transistor logic) output and is designed for use with the Sony Multiscan monitor. (QDP Computer Systems also has an 800 by 600 board called the QDP VIVA 800/Msync designed for use with the NEC MultiSync. Although the horizontal resolution of 1,000 exceeds NEC MultiSync specifications, I was able to run the 1000/Mscan with the NEC MultiSync. The only problem that I encountered was a slightly narrow display area.)

These are the simplest high-resolution color boards I've seen. Each is just a single board built around the NEC 7220A graph-



■ The QDP VIVA 1000/Mscan high-resolution color graphics controller (top) is very similar to the QDP VIVA 1000/16 (below). Both are single boards built around the NEC 7220A graphics display controller chip and 512K bytes of memory.



■ The QDP boards offer the advantages of a relatively low price for high-resolution color and the simplicity of the single-board design. These boards represent probably the lowest-cost approach to high-resolution color CAD.



### FACT FILE

**QDP VIVA 1000/Mscan  
QDP VIVA 1000/16**  
QDP Computer Systems Inc.  
23632 Mercantile Rd.  
Beachwood, OH 44122  
(216) 464-6600

**List Price:** QDP VIVA 1000/Mscan,  
\$1,295; QDP VIVA 1000/16, \$1,995.

**Requires:** PC, XT, AT, or RT.

**In Short:** These relatively inexpensive and simple single-slot high-resolution color boards include AutoCAD drivers. The cost of this simplicity is slow drawing speeds.

CIRCLE 688 ON READER SERVICE CARD





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**BOEING**

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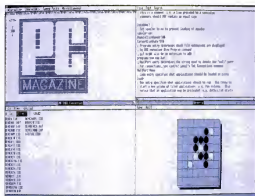


## HIGH-RES DISPLAYS

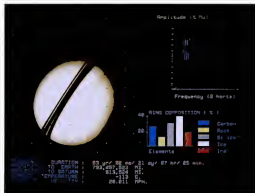
The newest high-resolution graphics boards are breaking the 640- by 480-pixel barrier that had been set by IBM's Professional Graphics Controller and Display. The resolution of the nine boards we tested ranges all the way from the 1,000- by 600-pixel display of QDP VIVA's 1000/Mscan to the 2,880 by 1,024 resolution of the ConoVision 2800. Some of the boards are even able to display up to 256 colors at the same time. The screen shots shown here display the range of resolutions and simultaneous colors that are available.



*Micro Display Systems' Genius VHR board and display are great for word processing, desktop publishing, and Windows. The horizontal resolution is 728 (about the same as a Hercules Graphics Card), but the vertical resolution is a whopping 1,008.*

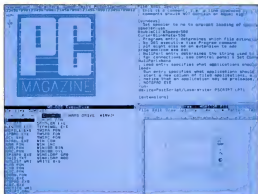


The ConoVision 2800 supports three horizontal on-screen resolutions—2,880, 1,440, or 720 dots—with a vertical resolution of 720 or 1,024. The Windows driver uses an 18 by 22 system font. The image above shows the system using 1,440 by 720 resolution.



*This Matrox PG-1280A demonstration program shows what can be done with 256 colors and a 1,280 by 1,024 resolution. While it took a while to shovel all the data that went into creating this image of Saturn out to the board, the results are spectacular.*

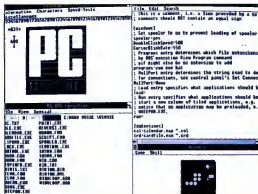




Monitorm's Viking 1 is a popular Windows display, and the new Windows driver looks good with its very crisp 12 by 16 system font. The 64-pin Hitachi graphics processor helps speed up the drawing, particularly of patterned fills.



The QDP VIVA 1000/Mscan, shown here running on a Sony Multiscan, displays its 126 colors in a resolution of 1,000 by 600.



A new entry in the high-resolution field, Sigma Designs' LaserView has a 1,664 by 1,200 resolution. The Windows driver uses a 16 by 24 system font—twice the resolution in both dimensions of the system font used on the EGA.



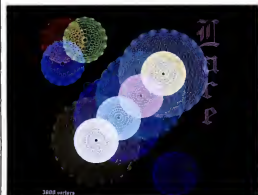
The QDP VIVA 1000/16, shown here on an Hitachi 19-inch monitor, has a resolution of 1,024 by 1,024 and displays 16 colors.

(continues)

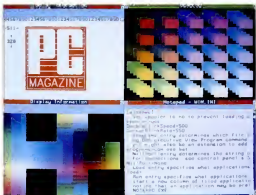


## ■ FOUR-FIGURE VIDEO

1" High Res Displays" continued



The Vectrix Pepe board is accompanied by various software, including some astonishingly fast demo programs. This particular demonstration program for the Pepe board draws these 3,800 vectors nearly instantaneously when running on an AT.



They said it couldn't be done, but Vermont Microsystems' Image Manager 1024 runs 256-color Windows with a resolution of 1024 by 800. Two of the Windows demonstration programs, shown running here, demonstrate the color gradations. The system font is 12 by 18.



Wyse's WY-700 has a resolution of 1,280 by 800 and does a fine job of running Windows. The use of the 8 by 12 EGA font makes the characters quite small but still readable.



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ics display controller chip and 512K bytes of memory.

The VIVA 1000/16 has a 1,024 by 1,024 resolution and displays 16 colors on an analog or TTL monitor (selectable by jumper). QDP sent us a Hitachi 3719A 19-inch color monitor for testing this board. QDP's VIVA 1000/256 board, which we did not have the opportunity to evaluate, has the same resolution as the VIVA 1000/16 but displays 256 colors from a palette of 16.8 million on an analog display.

Although the manual recommends that the VIVA boards be a secondary display system in addition to a normal video board, the output from a CGA or EGA can be routed into the VIVA 1000/Mscan or VIVA 800/Msync to share the Multiscan or MultiSync.

Software includes an AutoCAD ADI driver, a resident program for hardware zooming, and some demo programs. The VIVA 1000/16 is also compatible with Control Systems' Artist 1, which has widespread CAD support. The documentation of the VIVA boards is modest, about 60 pages, of which about one-third are reprinted specifications on the NEC 7220A graphics processor.

The best advantages of the QDP boards are the relatively low price for high-resolution color and the simplicity of the single-board design. These boards represent probably the lowest-cost approach to high-resolution color CAD.

Problems? The NEC 7220A graphics controller is really outclassed by the newer graphics processor chips. It's slow. When you watch a demo program drawing random rectangles and you can see that each color plane is filled in separately by the NEC 7220A, you can't help but feel a little embarrassed for the poor chip.

—Charles Petzold

## SIGMA DESIGNS

### LaserView

Sigma Designs' LaserView display system has a stunning 1,664 by 1,200 resolution with four gray shades. It is available with either a 15-inch or 19-inch white-phosphor monochrome display. (We tested the 19-inch model. This happened to be a Monitorm display but may or may not be

when the system is actually shipped to you.) With the 15-inch monitor, you get 150 dots per inch, which is getting close to the typical 300 dpi of a laser printer. The board is intended to be used as a secondary display system and does not have any emulation modes.

At the time of this writing, the board was still in the preproduction stages and no real documentation was available. Sigma Designs has done some good work with previous video boards, so I'm not too worried. Installation is very simple—just put it in a slot and connect the video cable. The board has an AT bus connector for 16-bit data transfers, but it can be installed in a PC or XT with some speed degradation.

The video adapter has no graphics processor, which is unusual for a board with such a high resolution. I was told by Sigma Designs that the display buffer is memory-mapped in switchable banks.

Sigma Designs sent us drivers for Auto-

CAD, Ventura Publisher, and Windows. It intends to also ship drivers for 1-2-3 and Symphony, as well as get support from the



## FACT FILE

### LaserView

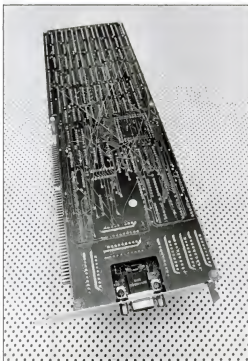
Sigma Designs  
46501 Landing Pkwy.  
Fremont, CA 94538  
(415) 770-0100

**List Price:** Board only, \$1,150; board with 15-inch monitor, \$1,895; board with 19-inch monitor, \$2,395.

**Requires:** PC, XT, or AT.

**In Short:** A new entry, still in preproduction at the time of this review, the Sigma Designs LaserView looks to be a hot Windows machine with a 1,664 by 1,200 resolution in black and white. I hope they fix the problems.

CIRCLE 844 ON READER SERVICE CARD

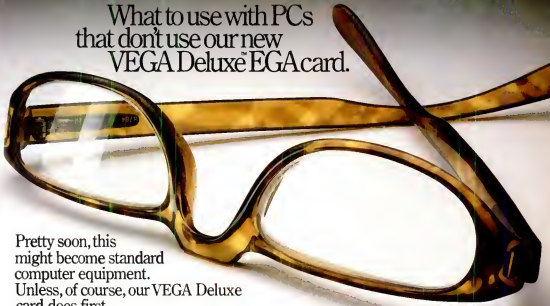


■ Sigma Designs' LaserView has an AT bus connector for 16-bit data transfers, but it can be installed in a PC or XT, with some speed degradation. The adapter has no graphics processor, which is unusual for a board with such high resolution. Sigma Designs says that the display buffer is memory-mapped in switchable banks.





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## ■ FOUR-FIGURE VIDEO

major CAD packages. The first *Windows* driver that Sigma Designs sent us was not in final form and had some problems with leaving garbage around the screen. This early driver also used the normal 8 by 12 EGA font, so the characters were quite small. How small? Well, I could do a readable 200-character column by 100-line *Windows* Notepad with this font, but I left noseprints on the screen.

A revised *Windows* driver from Sigma Designs had a new 16 by 24 system font, which cuts down the number of displayable rows and character columns by half—while greatly improving readability. It still had a garbage problem (which I suspect was partly due to the preproduction quality of the board) but otherwise worked much better.

Note that the price of the LaserView with the 19-inch monitor is the same as the price on the Monitorm Viking 1 board and monitor combination. The Viking 1 does *Windows* faster (with help from that Hitachi graphics processor), but the LaserView significantly raises the resolution watershed.—Charles Petzold

### VECTRIX CORP.

#### Vectrix Pepe

The Vectrix Pepe (pronounced "peppy") is a two-slot board with an AT bus connector, but it can be installed in either an XT or AT. (The slots on an old PC are too wide for a two-slot board.) As a result of the 16-

bit data transfers, performance will be best on an AT.

Vectrix Corp.'s Pepe series are all 1,024 by 1,024 color boards that can also run at 1,024 by 768 for a 4:3 screen ratio. We tested the Pepe4, which has 4 color planes for a 16-color display. Other models in the Pepe line include the Pepe4L with 4 color planes and a 4,096-color look-up table (\$2,695), the Pepe8 with 8 color planes (\$3,495), the Pepe8L with 16.8-million-color look-up table (\$3,995), and the Pepe12 with 12 color planes for 4,096 simultaneous colors (\$4,495).

The Pepe is intended to be used as a secondary display system. However, Vectrix plans to make a driver available that allows software to use the Pepe through BIOS or DOS calls, through which the board will appear to be a monochrome display. The board has a built-in 8 by 16 font with separate memory used for storing text information so that the 128-column by 64-line text

can overlay a graphics display.

The Monitronix 19-inch monitor that Vectrix sent us with this board has neither the brightness nor the contrast of the CGA and EGA color monitors that most of us are familiar with. But getting color in a 19-inch monitor is so nice that it tends to mute such petty complaints.

Vectrix has designed its own graphics-processing circuitry, using discrete chips built around a 6545 CRT controller. The command set has 33 drawing commands accessible through I/O ports. These are documented in the manual and encoded as a series of subroutines in C. Source code that can be used with the Lattice C compiler is provided on disk. The manual has lots of C programming examples and is even witty in the installation instructions, but it's not typeset, just a bound series of pages printed by a letter quality printer.

Other software includes diagnostics, a memory-resident zoom program, and

■ The Vectrix Pepe is a two-slot board with an AT bus connector, but you can install it in an XT or AT.



### PC MAGAZINE FACT FILE

#### Vectrix Pepe

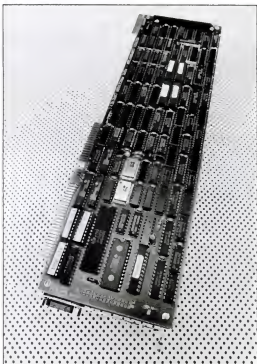
Vectrix Corp.  
2606 Branchwood Dr.  
Greensboro, NC 27408  
(800) 334-8181  
(919) 288-0520

List Price: Board, \$2,750; Monitronix MX-200 19-inch color monitor, \$3,750.

Requires: XT, AT, or Compaq Deskpro 386.

In Short: This high-end color board and display have extensive CAD support and loads of programming examples on disk and in the manual.

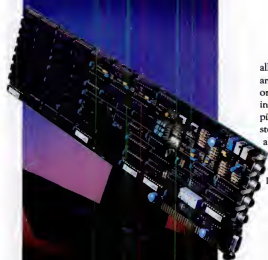
CIRCLE 88 ON READER SERVICE CARD





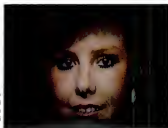
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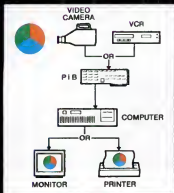
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CIRCLE 265 ON READER SERVICE CARD



## ■ FOUR-FIGURE VIDEO

some demo programs, including one doing vector drawing using direct memory access (DMA) that is astonishingly fast. (Assembly language source code for doing these DMA transfers is also provided.)

The Pepe has a lot of CAD support, including *AutoCAD*, *CADVance*, *EasyCAD*, *VersaCAD*, *MicroCAD*, and others. A VDI driver is also available.

—Charles Petzold

### VERMONT MICROSYSTEMS INC. Image Manager 1024

Vermont Microsystems' Image Manager 1024 (previously known as the VM-8825) is a sandwiched board that uses two AT slots. It provides a resolution of 1,024 by 800 with 256-color analog output. The 256 colors may be selected from a palette of 4,096 or (optionally) 16.8 million.

Vermont Microsystems' board is compatible with the IBM Professional Graphics Controller. Like the PGC, the board contains CGA emulation logic (a third board between the two main boards) to allow the Image Manager 1024 to function as the only video board in your system. Alternatively, the CGA emulation can be disabled and you can use it as a secondary display system.

The Image Manager 1024 can support normal PGC software by putting the smaller 640 by 480 image in the center of the display. This is not optimum, but it doesn't have the resolution to double the image the way the Matrox PG-1280A does.



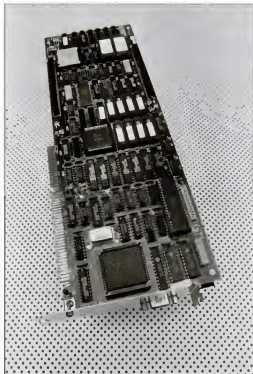
#### FACT FILE

Image Manager 1024  
Vermont Microsystems Inc.  
11 Tigan St.  
Winooski, VT 05404  
(802) 655-3800

List Price: Board, \$3,495; Mitsubishi C-8652 15-inch analog color monitor, \$2,149.  
Requires: AT or RT.

In Short: This PGC compatible adds better resolution, faster drawing speeds, and more versatile features to the IBM PGC. A new Windows driver does Windows in 256 nondithered colors.

CIRCLE 692 ON READER SERVICE CARD



Vermont Microsystems' Image Manager 1024 is a sandwiched board that uses two AT slots. The board includes an 80186 microprocessor running at 10 MHz and 1 megabyte of video RAM. The drawing processor is based on a 2901/2910 running at 8 MHz.

The board includes an 80186 microprocessor running at 10 MHz (the IBM PGC has an 8-MHz 8088) and 1 megabyte of video RAM. The drawing processor is based around an 8-MHz 2901/2910.

The Image Manager software includes diagnostics, a memory-resident program to switch video modes from the keyboard, and an interactive program to enter PGC commands from the keyboard or files. The source code for this program is included on the disks. The demo files that are used as input to this program are provided in ASCII form, so the user can study them in order to learn about PGC programming.

Vermont Microsystems also makes available a GSS VDI driver, a GEM driver, and a Windows driver. The Windows driver is the first that I've seen that runs on a PGC compatible and lets Windows use 256 nondithered colors. The 256 colors are combinations of eight shades of red, eight

shades of green, and four shades of blue. In comparison, Windows uses just eight pure colors on an EGA attached to a color display, using dithering to get a total of 262,144 patterned colors. The Image Manager 1024 is restricted to the set of 256 pure colors and does not do dithering.

Since the Windows driver can use the drawing capabilities of the PGC hardware and doesn't have to bother with dithered pixel patterns, some graphics operations (for instance, filled rectangles and ellipses) are very fast. However, where the PGC command set is inadequate (for instance, filled rectangles with curved corners), the speed is worse than that of an EGA. But I'm very impressed by the overall performance of Windows on the Image Manager 1024.

The manual is gorgeous. It's often amazing that video board manufacturers seem to care so little about the look of their





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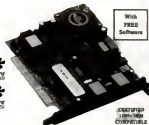
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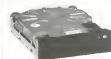
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## ■ FOUR-FIGURE VIDEO

documentation. This is an exception. There's a separate section on what Vermont Microsystems calls the "Professional Graphics Language" and an installation and operation section with C programming examples.—Charles Petzold

### WYSE TECHNOLOGY

#### WY-700

At \$999 for the adapter board and monitor, the WY-700 (previously reviewed in *PC Magazine*, Volume 5 Number 22) is the lowest-priced of all the video boards that are reviewed in this article. Wyse Technology's board emulates both a monochrome and Color/Graphics Adapter, but it offers you a resolution of 1,280 by 800. A 15-inch white phosphor screen is included with the board. You can install the WY-700 in a system that already includes a monochrome or Color/Graphics Adapter by making some jumper connections on the board.

Compared with the IBM Color/Graphics Adapter, the WY-700 offers double the horizontal resolution (1,280 rather than 640) and four times the vertical resolution (800 rather than 200). The on-board font is stored in ROM as a 16 by 16 character cell. In 80 by 25 text mode it is displayed with doubled rows so each character appears as 16 by 32. People accustomed to the 8 by 8 characters of the CGA will be bowled over by this. Even people accustomed to the monochrome display will see a real improvement in text quality.



### FACT FILE

#### WY-700

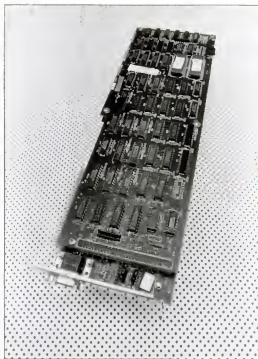
Wyse Technology  
3571 N. First St.  
San Jose, CA 95134  
(408) 433-1000

List Price: Adapter and monitor, \$999.

Requires: PC, XT, or AT.

In Short: A high level of monochrome and CGA compatibility, combined with a much higher resolution and a much clearer font, makes this low-cost monochrome board and display a good replacement for an existing video board. It does Windows.

CIRCLE 69 ON READER SERVICE CARD



Wyse's WY-700 emulates both a monochrome and color/graphics adapter, but at double the resolution. You can install the WY-700 in a system that already includes a monochrome or Color/Graphics Adapter by making some jumper connections on the board.

Utilities which Wyse Technology supplies with the WY-700 allow reducing this character size to 8 dots wide (so you can display 160-character columns across the screen) or 16 dots high (for 50 lines). The WY-700 BIOS defines video-mode numbers for these modes, so you are able to change them from within any programming language that allows you to make ROM BIOS calls.

When emulating the four-color CGA 320 by 200 mode, the WY-700 displays a 4 by 4 dot pattern for each CGA-compatible pixel, so it can do four shades of gray for the four colors. It does not mimic different colors in text mode.

The 1,280 by 800 native graphics mode maps the display area into two banks in the 64K-byte memory, starting at A0000. (This memory is also used by the EGA for the additional EGA graphics modes.) Full programming information is included with the board.

Software that accompanies the WY-700 includes some utilities and drivers for *Windows* and *GEM*. (Drivers are also available at separate cost for *I-2-3*, *Symphony*, *Dr. Halo*, and *PC Paintbrush*. Several CAD packages are also compatible with the WY-700.)

The *Windows* driver uses the standard EGA font and gives you about a 160-column by 60-line display in a full-screen Notepad. Hence, you can get a full-page display using just half of the *Windows* screen.

The one real drawback to the WY-700 is the interlacing of the display. It's not usually noticeable, but certain graphics displays reveal the slight flickering that is characteristic of interlacing. I did not notice the flickering in the text modes, however.—Charles Petzold

Charles Petzold and Winn L. Rosch are contributing editors of *PC Magazine*.



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Complement our US-286/10 with a big screen 14" high resolution, non-glare color display that boasts EGA and color compatibility. Crisp text and vivid color spring to life when used with our enhanced graphics adapter video card which features easily accessible mode switching and 256KB display RAM.

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# NEWVIEWS: A NEW PARADIGM FOR ACCOUNTING SOFTWARE

Like all accounting software packages, *NewViews*, from Q. W. Page Associates, helps small businesses automate their general accounting chores. But *NewViews* uses an unorthodox approach that breaks many of the rules adhered to by traditional accounting software.

For instance, most packages have menus that lead to standard modules, batch-process transaction entries, and force you to close your books every month. *NewViews*, however, provides a structured environment that includes accounting rules that allow you to customize nearly every aspect of an accounting module. *NewViews* operates in real time by updating your financial statements each time you enter a transaction. And *NewViews* is not constrained by the concept of monthly closings.

To fashion this new paradigm, *NewViews* borrowed concepts and features from spreadsheets, databases, and word processors. *NewViews'* lack of predefined accounting worksheets is the approach taken by spreadsheets, which also force you to design your own worksheets. Like a hierarchical database, *NewViews* lets you easily perform inquiries to retrieve and edit records or create custom reports.

*NewViews'* commands will also be familiar to most users. You can execute the same commands four ways: using a / you can access pull-down menus such as those

in *Javelin* or 1-2-3, or you can use a mouse for these menus; you can use Ctrl-key combinations, à la *WordStar*, or Alt-key combinations. Extensive context-sensitive help is just a keystroke (F1) away. We used a combination of these methods. We also used a keyboard macro program (*Keyworks*, by Alpha Software Corp.) to record some of the repetitive sequences of commands. We had no problem using the keyboard macro program and *NewViews*.

**THE HEART OF THE SYSTEM** The heart of the *NewViews* system is a four-level series of "views," each of which expands into the next and into which you enter increasingly detailed information. These levels are, in order: Home, Reports, Accounts, and Distributions.

The Home view gives you the names of three "reports"—Odds and Ends, Printers, and Procedures—that you use to install the package. In the Reports level you create the reports that will become your accounting modules, such as a balance sheet and income statement for your general ledger. Each line item on a report is an Account, which expands into a ledger of transactions, which further expands to show the detail of the transactions (or Distributions).

When you edit data in any of these levels, the package immediately calculates the effect of your change at all levels. You can expand and contract levels and change



*Using concepts borrowed from spreadsheets, databases, and word processors, Q. W. Page Associates has come up with a fresh and flexible approach to accounting software. But like any new idea, you'll either love it or you won't.*



## ■ THE PRICE WATERHOUSE REPORT

"views" to analyze results at every level.

Views are special screen formats that you can use to look at your data. The *setup* view is used to add accounts, control and format a report, and print a single period report. An *analysis* view is used to generate histograms to display your data, create multiperiod reports, and compute variances. The *notes* view allows you to create free-form notes of up to 120 characters to record additional information about a vendor, customer, or transaction.

In addition to understanding the structure of levels and views within those levels, the other key concept is the use of procedures. Procedures are similar to spreadsheet macros in that they represent a series of keystrokes and commands that perform operations. Generally procedures are used to facilitate data entry or to print output documents such as customer statements, invoices, or checks.

To benefit from the full power and flexibility of *NewViews*, you must use the *NewViews* Procedure Language. *NewViews* supplies 40 predesigned procedures, and you can also design your own. You can link your customized procedures to any of 39 function-key combinations (F1 is reserved for Help) so you can call them with one keystroke. Otherwise, you

may call any procedure from a menu.

Even if you use the predefined procedures, you'll still need to know how to modify them for many functions that are performed automatically in other packages. For example, most traditional packages let you set up a lookup table that contains the tax rates for different states and that will extract the values from the table automatically when necessary. In *NewViews* you could copy a predefined procedure and insert each tax rate in a separate version, or you could create a lookup table and program a procedure to call the proper tax rate from it.

**GETTING STARTED** Q. W. Page recommends that you read the documentation carefully—all of it. We did, and we think you'll need to as well, since we did not find the system's approach particularly intuitive. The package comes with five disks: a program disk, a help file disk, a set of empty data files, a printer and procedures disk, and a sample data disk. The company also provides a larger data set, consisting of eight disks with over 2½ megabytes of illustrative accounting data, to dealers to help them more fully understand, observe, and demonstrate the system's functions.

Installing the software is easy. You copy program files into a directory and then empty data files, which are blank worksheets in which you will store your company's records, into a subdirectory. When you define your own set of books, you are presented with three reports—Odds and Ends, Printers, and Procedures—that let you set system defaults and printer configurations and import either custom-designed procedures or those from the procedures disk.

You begin setting up your books in Odds and Ends by specifying the fiscal year (the only restriction is that it must end on the last day of a month), bells for error messages, formats for the date, the cursor, totals on (an efficiency technique to defer calculation of totals until exiting the system), and security passwords (three levels with a ten-character password for each level). The screen provides information on the audit-trail data for purged and edited files, as well as an inventory of the number of reports, accounts, and so forth, in your current system.

### The Price Waterhouse Team



*G. William Dauphinais is a management consulting services partner in the Sacramento, California, office of Price Waterhouse and has long been a regular writer of and contributor to the Price Waterhouse Report.*



*Timothy J. Lee is a management consulting services microcomputer coordinator in the Price Waterhouse national office in New York City.*



*Michael J. Siconolfi is a management consulting services manager in Price Waterhouse's Hartford, Connecticut, office. He specializes in design and implementation of financial information systems.*

PC  
MAGAZINE

### FACT FILE



**NewViews**  
Q. W. Page Associates  
Inc.  
1 St. Clair Ave., West 8th  
Floor  
Toronto, Ontario  
Canada M4V 2Z5  
(416) 923-4567

**List Price: \$695**

**Requires:** 256K RAM (512K recommended), two disk drives (hard disk recommended), DOS 2.0 or later.

**In Short:** *NewViews* gives users a great deal of flexibility to design their own accounting modules. It updates books in real time and is not constrained by the concept of closing books monthly. However, the system's approach is not very intuitive and requires that users be knowledgeable in accounting concepts and that they gain a thorough understanding of the package. Not copy protected.

CIRCLE 6 ON READER SERVICE CARD

**GENERAL LEDGER** In most traditional accounting packages, one of your first tasks is to define the chart of accounts for your general ledger. In *NewViews*, you must first custom design the general ledger module that will contain that chart of accounts. Moreover, the package provides no setup checklist or tutorial as to how you should proceed.

To create a general ledger for companies with multiple reporting levels (such as with multiple companies, departments, or branches), you may use physically separate files for each organization or create multiple reports in one set of data files. We used multiple reports in the same data files.

To set up your books, you must specify the current fiscal year-end, then create/add all of your reports and accounts. The quickest way to get rolling is to then select an opening date, add the opening financial position (accounts and amounts), and begin entering your regular accounting activ-



ity. If you wish, you can enter financial history in detail (by transaction) or with summary data from each period. With an analysis view of a report or account, you can display summary data from the last 10 years, with monthly period detail for the last 2 years.

We began by entering the current-assets portion of our balance sheet report. Figure 1 exhibits a printout of the screen used to create this report and illustrates the use of the report line item descriptions (up to 30 characters). You must assign each account a variable name (up to ten characters) to reference the account data. You use the account's variable name in conjunction with the "Total to" fields to do arithmetic for your reports. Unlike a spreadsheet, in which you enter cell names and operations, *NewViews* lets you enter, for instance, the name of each bank in which you have deposits and the amount deposited there, in order to compute your total cash. You can also use the variable name to combine an account total with totals in up to two other accounts in the same or in a different report. This interaction between accounts is how the system updates accounts in real time.

Using examples of financial reports, we entered all the descriptions first, printed a report, chose our account names, and then

## ■ Using the /Document View command, you can alter the view of vendor account data to display only paid invoices, open invoices, or historical transactions.

completed the report specification. This made data entry easier and allowed us to better plan the use of the variable names. Error checking exists at both the report and account level to ensure that entries are balanced and entered into valid account names.

**ACCOUNTS PAYABLE** To create an accounts payable facility, you design a report in which vendors are represented as accounts. You maintain invoice and payment details in the ledger view of each account. You can store pertinent information

about each vendor—such as addresses, phone numbers, standard terms, and contact persons—in each account's note view. However, since notes are entered not into specified fields but as free-form data, getting the information back out of the note view can be tricky. To guarantee uniform placement of data, you should design and maintain your own master format.

When establishing the accounts, you can choose the open item or balance forward methods of accounting. The *NewViews* documentation assumes you understand the difference between them (with the open item method, you match payments with corresponding items on an itemized bill; the balance forward method applies payments to the total balance), and it provides guidance on processing each method. Since *NewViews* does not structure the order in which you enter your payables, select them for payment, or choose the method used for treating partial payments, you must control the processing in a consistent manner.

You can age the payables for vendors by using the open item method. However, we found what we believe to be a flaw in the design of this feature. The analysis view allows an invoice to age only from the month of the transaction, not from the date of the invoice. As a result, an invoice

Setup: Balance Sheet - Consolidated				12/31/85					
Balance Sheet - Consolidated	Beg: 12/01/85	End: 12/31/85	Type: A	C	U	Name	B Total to	Total to	T Report
CURRENT ASSETS									
1st National Bank		23,456.00		2		1STNAT	D TCB		BS-A
State Security Bank		281,480.49		2		STATE	D TCB		BS-A
Bredon National Bank		257,301.28		2		BREDON	D TCB		BS-A
		-----							
Total Cash in Bank		562,237.77			S	TCB	D TCA		T BS-A
									BS-A
Petty Cash on Hand		434.15		2		PCASH	D TCA		BS-A
									BS-A
Total Cash		562,671.92			S	TCA	D TCURA		T BS-A
									BS-A
Accounts Receivable		123,332.67		2		TAR	D TCURA		BS-A
Retail Inventory		324,156.87		2		TRI	D TCURA		BS-A
Prepaid Assets		2,345.78		2		TFA	D TCURA		BS-A
Office Supplies		5,434.12		2		TOF	D TCURA		BS-A
		-----							
Total Current Assets		1,018,141.36			S	TCURA	D ASSETS		T BS-A
		-----			D				BS-A
Description	Beg: 12/01/85	End: 12/31/85	Type: A	C	U	Name	B Total to	Total to	T Report

**Figure 1:** This is a printout of the screen we used to set up the current assets portion of our balance sheet report. You can specify the report description (Balance Sheet—Consolidated), the number of columns, and an account name (up to ten characters) to reference the account

data). The name is used with the "Total to" fields to do arithmetic for your reports. An account total may be combined with up to two other accounts on the same or a different report. This is how the system updates accounts in real time.



## ■ THE PRICE WATERHOUSE REPORT

dated January 29 would show up as being over 30 days old on February 1. This may or may not represent a problem, but you should be aware of it. Since the analysis view of the accounts receivable facility operates in the same manner, it is similarly difficult to automatically prepare a cash flow worksheet without resorting to special procedures or exporting data to another applications program.

One of the most interesting features of the system is the way you view account data. Using the /Document View command, you can alter the view of vendor account data to display only paid invoices, open invoices, or historical transactions. With the analysis view, you can examine vendor totals as a percentage of total purchases (or of any other account) and plot them as a histogram. We found these options useful and easy to use.

*NewViews* includes a procedure for printing checks and stubs. Unfortunately, the procedure is cumbersome to use. You must highlight invoices you wish to pay before running the procedure. If these invoices are not in a contiguous block, you must either move them or run the check-paying procedure several times. (However, you can tell the program to jump over an invoice and not pay it by putting a "Hold" indicator in its description field.) Nor can you combine payments to the same vendor into a single check. More worrisome, when we ran the procedure using the demonstration data supplied with the package, the program copied data from the inventory notes instead of the addresses from the vendor notes, when printing the checks. We therefore recommend that you test procedures extensively. In our view, Q. W. Page should consider expanding the number and nature of procedures provided with the system (to help with tasks such as 1099 forms generation).

**ACCOUNTS RECEIVABLE** *NewViews* handles accounts receivable in a fashion similar to the way it handles payables. In this case, you use an account for each customer and a ledger view of those accounts to record the customer's transactions, along with opening, closing, and running balances. Different ledger views allow you to segregate useful information. For example, the *debit* view will show only invoices

Ledger: COOPER & COMPANY LTD
34 25 85

Select View: L = Ledger  
H = History  
N = Notes  
O = Open Items  
X = Closed Items  
D = Debit Items  
C = Credit Items

Name: COOPER		Reconcile R	
Description: Cooper & Company Ltd.		Date: 04/04/85	
Normal Bal: 0		Balance: 0.00	
Next Ref#	0	Closing Bal	25,375.94
# of Items	29	Opening Bal	5,009.94
Date	Ref#	Description	Amount
01/01/85	0	invoice	5,009.94-
			0.00
Date	Ref#	Description	Amount
			Balance

*NewViews* lets you set up different ledger views to segregate information. For instance, with accounts receivable, the *debit* view will show only invoices and finance charges, while the *credit* view displays payments and credit memos.

and finance charges. The *credit* view displays payments and credit memos. The *open* view shows unpaid customer items and can be used for an open item customer statement. The *closed* view shows a detailed record of past transactions. The *history* view displays up to a 10-year summary of the customer's account. And finally, you can use the *notes* view to record customer demographic information and to log contacts with the customer.

As with accounts payable, you can choose either the open item or balance forward method. You age open items by period (not specific date), as mentioned previously. The documentation suggests you use the account's budget data field to record credit limits. As you enter sales orders, you can open a second window showing the customer's credit limit. But you'll have to carefully watch this second window to make sure that the sales you enter do not exceed the customer's credit limit, or you'll need to develop custom procedures to warn you should this occur. Many traditional accounting systems' order entry modules automatically prevent you from entering any sale that would put a customer over his limit.

Six of *NewViews*' predefined proce-

dures directly address basic accounts receivable functions such as calculating late charges or applying finance charges. You'll need to tailor these to correspond to your preferred methods of accounting for the associated revenue. For example, if you want to calculate a late charge based on the original date of the invoice, add that amount to the invoice, and then record the increase as "interest income," you'll have to write a special procedure. A traditional package, however, would calculate late charges automatically, requiring you to simply decide on the method of calculating the charges and establishing a default account. While *NewViews* is more flexible, it is more time-consuming to establish basic functions.

**INVOICE/ORDER ENTRY** *NewViews* allows you to record orders after the fact and in real time. Currently, the system does not maintain an individual item inventory. Instead, it requires you to calculate invoice extensions, taxes, and shipping charges manually or program a custom procedure to perform the calculations. The demonstration data set uses a separate account for each item in inventory. This seems unwieldy for those who



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Report generator	NO	<b>YES</b>
Multi-user option available	NO	<b>YES</b>
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**CIRCLE 472 ON READER SERVICE CARD**

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History of purchases

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History of sales, cost, and net  
Adjust cost  
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Discount for any line  
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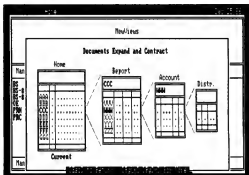
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## LEVELS OF NEWVIEWS

The heart of NewViews' structure is its four levels of "views": Home, Reports, Accounts, and Distributions. Each of these views expands into the next, and you enter increasingly detailed information into them. Screen A is the help screen that shows you how documents expand and contract. Screen B shows the Home view. From this view we chose to expand the Income Statement Report. You can see the analysis view of that report in Screen C. The Account level is shown in Screen D. Specifically, this level is the Advertising Print's Selling Expense account, which shows the amounts of all line items charged to that account. We chose to expand the last line item, dated April 1, 1985. Screen E shows the Distribution view of the Advertising Print's Selling Expense ledger line item. If this were not a simple account item, it would show the details of the expense-account components.

A



C

Income Statement

Period 1:	(1)	(2)	(3)
Begin	Jan 01, 85	Jan 01, 84	Jan 01, 84
End	Apr 30, 85	Apr 30, 84	Dec 31, 84
(Loss)	0	0	0
Period 2:			
Begin	000 00.00	000 00.00	000 00.00
End	000 00.00	000 00.00	000 00.00
Balances:	% of		
Graphs:	# of Columns	Scale	0 0 0 0 0 0

Description	1985 to date	1984 to date	1984
REVENUE			
Net Sales	426,822.81	261,977.46	1,189,812.44
Cost of Goods Sold	274,222.43	282,429.75	927,132.30
Gross Profit	151,600.38	79,547.71	262,680.14
SELLING EXPENSES			
Advertising - Print	2,372.85	1,206.07	4,987.93

E

Advertising - Print

Date	Self	Description	Amount	Total
Jan 01, 85	5	Media Presentations Inc.	935.68	17,642.97
Feb 11, 85	34	Media Presentations Inc.	371.12	18,214.09
Mar 04, 85	62	Media Presentations Inc.	618.58	19,832.67
Apr 01, 85	86	Media Presentations Inc.	627.75	20,460.42

B

NewViews Accounting

Today's Date Apr 22, 85

Name	S	Description
BS		Balance Sheet
IS		Income Statement
AR		Accounts Receivable
AP		Accounts Payable
CP		Changes in Financial Position
CCS		Sales Schedule
COGS		Cost of Goods Sold Schedule
IN		Inventory Records
FA		Fixed Assets
PP		Payroll Tax Withholdings
PE		Payroll Expenses Schedule

D

Advertising - Print				000 00.00	
Name	BS ADMPRINT			Reconcile	
Description	Advertising - Print			Date	
Normal Bal	0			Balance	000 00.00
Next Bal	0			Closing Bal	15,468.34
# of Items	4			Opening Bal	17,007.29
Date	Self	Description	Amount	Balance	
Jan 07, 85	5	Media Presentations Inc.	935.68	17,642.97	
Feb 11, 85	34	Media Presentations Inc.	371.12	18,214.09	
Mar 04, 85	62	Media Presentations Inc.	618.58	19,832.67	
Apr 01, 85	86	Media Presentations Inc.	627.75	20,460.42	
Date	Self	Description	Amount	Balance	





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C O U N T E R P O I N T

## NEWVIEWS: LEARNING TO LOVE IT

**I**t's not that accounting procedures are so arcane; you just need a certain mindset to understand them. I don't have it. That is, I didn't think I had it until I saw *NewViews*.

There's something magical about *NewViews*' user interface that makes the whole thing crystal clear to me. Computerists have two basic views of the world: tabular or hierarchical. The former favors spreadsheets; the latter like databases. I'm hierarchical, and so is *NewViews*. It just makes sense when I see all those transactions happening in real time.

It makes sense to others, too. *New-*

*Views* is finding favor in college-level courses that teach accounting. It's kind of like a cutaway view of how accounting really works. But its biggest fans are experienced users who cut their teeth on word processors, spreadsheets, and database programs. One day they need an accounting program. Invariably, they're put off by the remoteness of all the batch-oriented accounting systems out there. Then they see *NewViews*, and they feel like they're home. And so they are. That's why *PC Magazine* gave *NewViews* an Award for Technical Excellence.—**Bill Machrone**

have more than a few inventory items and want inventory management and sales analysis reports. We were told that Q. W. Page is working on a module to handle individual item inventory for release later this year.

**OTHER MODULES** *NewViews* uses the same basic transaction data structure for other accounting functions, including payroll, consolidations, time and billing, and what it refers to as "short-term planning and control." For instance, the payroll accounting facility is very basic. Since you would need to create your own procedures to perform salary and withholding calculations, we recommend that you use *NewViews* for recording manually calculated payroll amounts and accruals.

But despite its limitations, it is clear that the software can be applied to a diverse set of accounting problems. If your accounting requirements are typical of most small businesses, and once you have a real understanding of the ins and outs of the *NewViews* approach, you can use the system for a wide variety of data gathering, analysis, and reporting.

**SECURITY AND CONTROL** *NewViews*' password scheme provides three levels of security, referred to as Auditor, Comptroller, and Operator. You can establish a password for each level. Anyone

with the Auditor password has complete access to all records and files. Those with the Operator password can be restricted in their access to certain information. However, a more practical solution would be to assign each individual a password through which the system controller could assign restrictions.

**IMPORT/EXPORT FACILITIES** *NewViews* can export a report, account, ledger views, or any highlighted block of information into DIF, ASCII, or keystroke format. The latter is used to transfer records from one set of *NewViews* accounting records to another—for example, transferring data from a branch to the home office. The record exported for a report is a fixed format and contains 153 data fields for each account item. A record of this size can be awkward to load into a database or spreadsheet for further manipulation. However, when exporting account ledger information, the package exports only eight fields for each simple transaction or for distribution within a transaction—a more manageable number.

*NewViews* cannot easily import data. You will need to format data using a word processor or to write a program that can properly format your data with the correct control characters. You may obtain the specifications for writing the import file from Q. W. Page.

**DOCUMENTATION** Documentation for *NewViews* consists of three manuals: Getting Started, Printers and Procedures, and a user's manual. The documentation is comprehensive, if a bit imposing (268 pages of relatively small text!), and contains many examples of screens and reports. We think that most new users will spend a good deal more time with the *NewViews* documentation than they might with that of a more traditional accounting package. And to use the package effectively you'll need to have a thorough understanding of (a) accounting, (b) how *NewViews* works, and (c) how the *NewViews* model can be used to keep your books. Unfortunately, the package includes no tutorial to help you. Training is available through some U.S. dealers, and Q. W. Page offers 2-day training seminars at a cost of \$895 (Canadian) at its offices in Toronto.

Phone support is available without charge from 8:30 A.M. to 8 P.M. Eastern Standard Time. Registered users receive a helpful newsletter that contains tips for using *NewViews*. Q. W. Page is developing a list of independent system developers who can install and/or develop custom procedures. All upgrades to-date are available for only the shipping costs.

**SOME CAUTIONS** The only correct way to exit the program is to use the /Document Shut command. If you lose power or do a warm reboot while in *NewViews*, the data files will be corrupted. To recover, you must restore your last backup and rekey any data entered since that time. While *NewViews* maintains logs of purged or edited items, it does not log newly entered data. For this reason, we wrote a batch file to copy our books to a backup directory each time we exited the system.

**SUMMARY** Anyone constrained by the traditional "accounting model" used in most of the competing small-business accounting products will welcome the flexibility offered by *NewViews*. It certainly takes a new view of an old problem. But you'll have to roll up your sleeves and design your modules and procedures. You'll need a good grounding in accounting and a thorough understanding of the package.—**G. William Dauphinais, Timothy J. Lee, and Michael J. Siconolfi**



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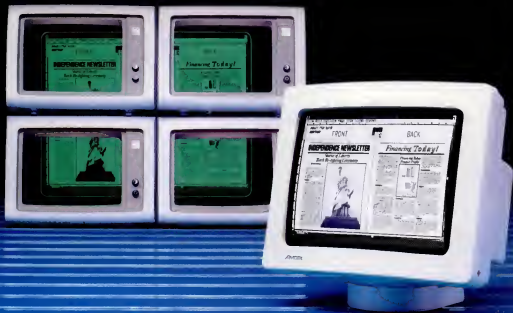
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1280 provides complete monochrome and color graphics compatibility.

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Lotus 1-2-3  
Symphony

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# TECHNICAL SUPPORT

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When personal computers moved into the business world, thousands of normally nontechnical employers and employees were faced with a highly complex piece of machinery—and very little idea of what to do with it. Computer and software manufacturers, in an effort to ease the way for their potential customers, quickly began to include what they considered useful instructional material with their products.

Their product manuals differed greatly in scope and appearance, from READ.ME text files to handsomely bound and illustrated volumes. Unfortunately, these man-

uals soon gained a well-founded reputation for being, at best, difficult to understand, and at worst, practically useless.

When the first IBM PCs went on the market, the same people who had created the programs wrote the user manuals. In many cases, this practice was a serious mistake, since these excellent programmers were not always clear writers. Even if the programmer had a talent with prose, he tended to forget to include the more basic problems that new users faced—for example, how to place data files on the B: disk. Consumers could count themselves lucky if the manuals included indexes or had a

---

*Publishers are busy promoting alternatives to product manuals that are confusing, sketchy, or just plain bad. Our reviews of what they're offering indicate some present, potential, and near-miss best-sellers among the many competitors for your book budget and your bookshelf space.*

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## ■ BOOKS FOR TECHNICAL SUPPORT

logical page-numbering scheme.

Once software vendors saw that these inadequate manuals could hurt sales, many did a 180-degree turnaround. They began to assume a total unfamiliarity on the part of the reader, not only with the program, but with the computer it was to run on. The results were bulky volumes that dedicated several chapters to understanding DOS, formatting disks, copying files, creating subdirectories, and other subjects that most computer owners already knew (or, at least, should have found in their DOS manuals). The user who simply wanted to know how to run the program had to first plod through a lot of unnecessary material.

**THE RUSH TO PUBLISH** Naturally enough, beleaguered computer users turned to bookstores for a path through this technological wilderness. Publishers were happy to oblige.

In 1980, before the IBM PC even hit the market, Books in Print listed 650 books on computers. Most were instructional manuals on COBOL, FORTRAN, and other languages, or references on general technical information. Two years later, the number listed had jumped to 1,157. By 1984, 3,160 computer books—the majority of them dealing with microcomputers—crowded the shelves of bookstores and computer retailers.

Unfortunately, the rush to fulfill the needs of this new and burgeoning market produced many books that were not much better than the manuals they purported to supplement. Editors who had little or no understanding of the subject accepted the assurances of authors that they were experts. So while many good, comprehensive books were published by knowledgeable authors, others were put out by people who had hardly more experience in the field than the readers themselves.

And those readers were quickly overwhelmed by the number and variety of books available. For example, in 1984 there were 32 books about Lotus's *1-2-3* and 34 on *dBASE II*, while *WordStar* generated 22 titles. Also available were general instructional manuals on how to select a spreadsheet or database package and self-help books on choosing and maintaining hardware, not to mention countless volumes explaining to the supposedly com-

## OUR REVIEWERS

**Christopher Barr** is the SysOp of the PC Magazine Interactive Reader Service. He is also a frequent contributor to *PC Magazine*.

**Bruce Brown** is a principal at Soft Industries, a Connecticut computer consulting firm. He is the founder of the Connecticut Computer Society and has taught business uses of computers at various area colleges.

**Stephen Randy Davis** is a frequent contributor to *PC Magazine*.

**John Dickinson** is Editor-in-Chief of *Computers in Banking* magazine. He is a contributing editor of *PC Magazine*.

**Christopher Johnston** is a former assistant editor at *PC Magazine* and a frequent contributor.

**Mitt Jones** is an assistant editor at *PC Magazine*.

**Barbara Krasnoff** is a former associate editor at *PC Magazine*. She writes frequently on the topics of computers and robotics for various publications.

**Catherine D. Miller** is an assistant editor at *PC Magazine*.

**Jon Pepper** is a frequent contributor to *PC Magazine*.

**Charles Petzold** is a contributing editor of *PC Magazine*.

**Martin Porter** is editor of *Video Magazine's Buyer's Guides*, a syndicated columnist for CompuNews Service, and a regular columnist for *GQ* magazine.

**Jeff Prossie** often writes the Programming/Utilities column for *PC Magazine*.

**Vincent Puglia** is a frequent contributor to *PC Magazine*.

**Robin Raskin** is a New York-based free-lance technical writer who specializes in education and family computing issues. She writes for a number of computer publications and is a frequent contributor to *PC Magazine*.

**Roberto Rivera** is an in-house computer consultant for George Mason University. He has also worked as a network applications programmer for Chase and Arlington in Rosslyn, Virginia.

**M. David Stone** is a contributing editor of *PC Magazine*. He is a free-lance consultant specializing in computer communications and has written three computer books.

**Ethan Winer** is a professional software developer and owner of Crescent Software in East Norwalk, Connecticut.

puter-shy masses why the computer was their friend.

Today market forces have caused a considerable drop in the number of computer books competing for your attention. From over 3,000 published in 1984, the number of books published decreased to 2,449 in 1985 and to 1,785 in 1986—almost half the number publishers had offered only 2 years before.

**GOOD, BASIC INFORMATION** As the level of general knowledge about computers has increased, so has the level of quality of the books about computers now on

the market. Publishers have become more wary of producing unnecessary or badly researched material. Today you can rely on most computer books for good, basic information, with some advantages over that found in user manuals.

One advantage that a book has over a manual is its independence from the manufacturer. Although both want the product to sell well, an author is more willing to discuss the product's deficiencies. This type of discussion not only protects users from unpleasant surprises but helps solve problems by giving advice on how to deal with the deficiency.



# Interlude II

## MATA HARI—Interlude #156

*What time does your flight arrive?*

*Oh, are you picking me up?*

*Look for a tall brunette in a trenchcoat...and nothing else.*

*Ah, you've been playing Interlude again!*

*Right.*

*Maybe I can catch an earlier flight.*

*Please do.*

Interlude II. The long-awaited sequel to the first adult computer game in history is finally here. It's provocative and playful. Outrageous and romantic. It has all the excitement of the original Interlude, plus significant new features.

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The original Interlude took the computer world by storm six years ago, creating a media sensation:

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**US Magazine:** "The most edifying third party to join couples between the sheets since The Joy of Sex."

**Chicago Tribune:** "This marriage of computer technology and sex is natural...erases forever the image of computer-users as dull guys with slide rules in their pockets and square roots on their minds."

**Money Magazine:** "Sometimes it's easier to tell a computer what you want than it is to tell your partner."

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PCM



## ■ BOOKS FOR TECHNICAL SUPPORT

Also, consulting a computer book can be a good way to avoid mistakes that others have already made. Reading about a difficulty the author overcame in creating a spreadsheet formula is less frustrating than trying to create that formula yourself. In addition, many books include examples of ready-made applications.

Unfortunately, you may still encounter problems when searching for a good computer book. Computer stores do not tend to stock a wide variety of titles, and certainly their salespeople are more interested in selling \$500 software than a \$10 softcover. And while most bookstores now dedicate separate sections to computer literature, their clerks may not be able to offer help in selecting the best title for your needs. In an informal survey of retail bookstores in New York City, we found that most of the sales personnel had little or no computer knowledge.

**HOW TO BUY THE RIGHT BOOK** To aid you in choosing among the computer books on today's bookshelves, *PC Magazine* staff and contributors did some research and came up with several books that they felt represented the best of what was available—or what could have been the best if it weren't for certain clearly defined flaws—and the reviews of these books appear below. (Incidentally, we weren't really surprised to see some PC authors among the scribes of these books—good work attracts a wide audience.)

But first, some general guidelines: When choosing a computer book, examine the date of publication before you buy. Computer books can become dated very quickly. We came across some books that were highly recommended when originally published, but they have been made less useful by subsequent updates to the programs they discuss. David Schneider's fine book on BASIC, for example, deals with an older version of that programming language, and Alfred Glossbrenner's otherwise excellent volume on obtaining free software is now out of date.

Some subjects have not as yet been adequately treated by publishers. We found, for example, that few books on computer graphics were available, and none could be considered definitive. Yet many books have been written on such popular pro-

grams as Lotus's *1-2-3* and *dBASE*; and all the more popular word processing programs are more than adequately covered.

For the most part, if your hardware or software product came with a reasonably well-produced manual and you have the time to examine the product in depth, you can probably get along without buying a book on the subject. But if you feel that you need more information, or if you're dealing with a highly complex program, one of the books reviewed here can save you considerable time and effort. In addition, many people trust a third party more than the software publisher to give them the real scoop on the product.

**FOR YOUR READING LIST** The following books deal with a variety of subjects within the topic of MS-DOS computers. Several volumes reviewed fall into the category of general information; they give advice and offer information on such topics as general PC operations and shareware and free software. Some allow you to take advantage of the more subtle capabilities of DOS. Some examine the major software packages in the database (*R-base System V*, *dBASE III Plus*), spreadsheet (*SuperCalc* and *1-2-3*), and word processor (*Microsoft Word*, *WordStar*, *XyWrite*, and *WordPerfect*) categories. Others give beginning or advanced instruction in programming languages such as Assembler, C, BASIC, and Turbo Pascal. Two fall into the communications category: one is a general book, the other about *CrossTalk XVI*. Finally, one book is about networking.—*Barbara Krasnoff*

## GENERAL COMPUTING

### Inside the IBM PC

By Peter Norton

If you've ever wondered just what DE-BUG is and how to use it, what a file allocation table is, or are just curious to know more about your PC, then Peter Norton's *Inside the IBM PC* (\$21.95, copyright 1986) could be the book for you.

Norton, who is well known for his *Norton Utilities* and popular columns, created a classic with the first edition of *Inside the*

*IBM PC*. Now, this latest revision is not only larger, but, since it also reflects the many changes that have occurred in the world of personal computers, it's that much better.

*Inside the IBM PC* covers everything from the history of the IBM PC family to theory and practice on working with DE-BUG, and it doesn't leave out much in between. The book runs just shy of 400 pages but is consistently readable, intelligent, and comprehensive. The book should probably be subtitled "Everything You Always Wanted to Know about the PC But Were Afraid to Ask," since it puts so much information in one place. However, it's obvious that Norton enjoys computers, and his enthusiasm comes through. Rather than being dull or tedious, the book demonstrates Norton's gift for lucidly explaining a wide variety of topics without talking down to the reader.

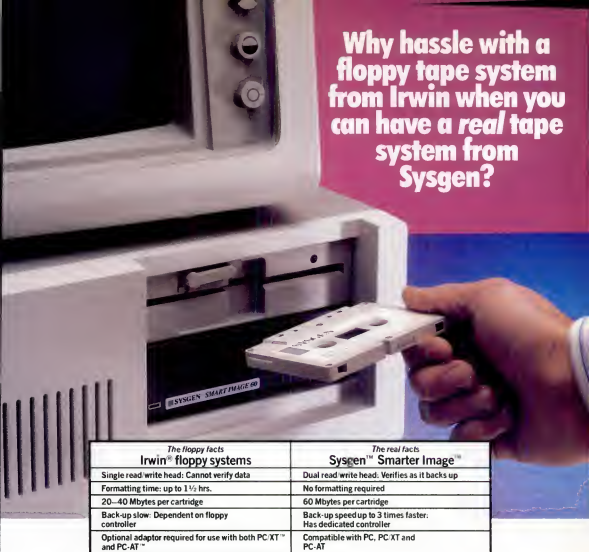
Norton's book is almost two books in one. It covers a great deal of basic material that can help to fill in gaps and expand the knowledge of novice users. And it also covers some fairly meaty material, identified by its own heading, for those with more serious interest. The book can also potentially serve as a textbook, since most chapters end with "Some Things to Try"—questions that generally seem best suited for a classroom discussion.

In the introduction Norton stresses that the book is really about understanding. By dividing the book into two levels of material, he's given readers the opportunity to approach understanding the PC at a level that best corresponds with their needs and interests. Even if you don't want to be a programmer, it's nice to know what interrupts are and how DOS works and maybe pick up a few tricks that you won't learn in your *1-2-3* manual. Included with the book is a series of BASIC programs and utility programs that augment the material in the book, including two programs from *The Norton Utilities*.

*Inside the IBM PC* is an excellent basic source book for the PC: even if you don't read it all straight through, it's nice to know you can pick it up and find some valuable help. In sum, if you want to expand your knowledge base about your PC, you'll find *Inside the IBM PC* a good read and a good buy.—*Jon Pepper*



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## FACT FILE

### GENERAL COMPUTING



**Inside the IBM PC**  
By Peter Norton  
Prentice-Hall Inc.  
Div. of Simon &  
Schuster Inc.  
200 Old Tappan Rd.  
Old Tappan, NJ 07675  
(201) 767-5049

ISBN: 0-89303-583-1

List Price: \$21.95

Copyright: 1986

**In Short:** A revision of a classic work on the IBM PC, this well-written and informative book is the one to start with and stay with.

CIRCLE 666 ON READER SERVICE CARD



**How To Get Free Software: The Master Guide to Free Programs for Every Brand of Personal or Home Computer**  
By Alfred Glossbrenner  
St. Martin's Press Inc.  
175 Fifth Ave.

New York, NY 10010

(212) 674-5151

ISBN: 0-312-39563-9

List Price: \$14.95

Copyright: 1984

**In Short:** A source of free or low-cost software through the public domain, user groups, bulletin boards, and other sources; needs updating but still offers a wealth of programs.

CIRCLE 667 ON READER SERVICE CARD

### DOS



**PC-DOS: Introduction to High-Performance Computing**  
By Peter Norton  
Prentice-Hall Press Inc.  
Div. of Simon &  
Schuster Inc.  
200 Old Tappan Rd.

Old Tappan, NJ 07675

(201) 767-5049

ISBN: 0-89303-752-4

List Price: \$18.95

Copyright: 1985

**In Short:** The best book for someone new to IBM-PC-compatible computing. Norton presents the essential information about DOS clearly without being patronizing. Not an exhaustive reference text, this volume works well in conjunction with the DOS manual.

CIRCLE 668 ON READER SERVICE CARD



**Advanced MS-DOS**  
By Ray Duncan  
Microsoft Press  
16011 NE 36th Way  
Box 97017  
Redmond, WA 98073-9717  
(206) 882-8080

ISBN: 0-914845-77-2

List Price: \$22.95

Copyright: 1986

**In Short:** Advanced MS-DOS is the best programming guide for MS-DOS to come along in some time. Its thoroughness, attention to detail, and overall readability make it a resource that every assembly language and C programmer should own.

CIRCLE 669 ON READER SERVICE CARD

### DATABASES



**Understanding dBASE III Plus**  
By Alan Simpson  
Sybex Computer Books  
2021 Challenger Dr.  
#100  
Alameda, CA 94501  
(800) 227-2346

(415) 523-8233

ISBN: 0-89588-349-X

List Price: \$19.95

Copyright: 1986

**In Short:** This is the first book to get after, or perhaps even before, you buy dBASE III Plus. Alan Simpson has been writing about dBASE for years and does an excellent job. This book is a necessity for beginners, helpful for "experts," and great for everyone in between.

CIRCLE 664 ON READER SERVICE CARD



**Understanding R-base System V**  
By Alan Simpson  
Sybex Computer Books  
2021 Challenger Dr.  
#100  
Alameda, CA 94501  
(800) 227-2346

(415) 523-8233

ISBN: 0-89588-394-5

List Price: \$19.95

Copyright: 1987

**In Short:** A well-written and easily followed tutorial through the basics of R-base System V that adds little to Microrim's own documentation. Experimenting on your own will teach just as much, if not more.

CIRCLE 663 ON READER SERVICE CARD

### SPREADSHEETS



**Douglas Cobb's 1-2-3 Handbook**  
By Douglas Cobb, with  
Steven S. Cobb and Gena  
B. Cobb  
Bantam Books Inc.  
666 Fifth Ave.  
New York, NY 10103

(800) 223-6834, ext. 479

(212) 765-6500, ext. 479

ISBN: 0-553-34389-0

List price: \$22.95

Copyright: 1986

**In Short:** Douglas Cobb's 1-2-3 Handbook is the latest and most definitive work yet from the man who "wrote the book" on using 1-2-3. It includes many helpful tips and devotes a chapter to many of the 1-2-3 enhancements, such as HAL.

CIRCLE 662 ON READER SERVICE CARD



**The SuperCalc Program Made Easy**  
By Chris Wood  
Osborne/McGraw-Hill  
2600 Tenth St.  
Berkeley, CA 94710  
(800) 227-0900  
(800) 772-2531 (in

Calif.)

ISBN: 0-931988-88-8

List Price: \$17.95

Copyright: Second edition, 1987

**In Short:** Aimed squarely at beginning spreadsheet users, *The SuperCalc Program Made Easy* offers a nearly painless introduction to SuperCalc.

CIRCLE 661 ON READER SERVICE CARD

### WORD PROCESSING



**Word Processing Power with Microsoft Word**  
by Peter Rinearson  
Microsoft Press  
16011 NE 36th Way  
Box 97017  
Redmond, WA 98073-9717

(206) 882-8080

ISBN: 0-914845-89-6

List Price: \$19.95

Copyright: 1986

**In Short:** Rinearson's book is an encyclopedia of tips and tricks for the power user or professional writer who wants to get the most out of Microsoft Word.

CIRCLE 660 ON READER SERVICE CARD





**Mastering WordPerfect**  
By Susan Baake Kelly  
Sybex Computer Books  
2021 Challenger Dr  
#100  
Alameda, CA 94501  
(800) 227-2346  
(415) 523-8233

ISBN: 0-89588-332-5

List price: \$19.95

Copyright: 1986

**In Short:** Kelly makes learning WordPerfect easy, quick, and enjoyable. From keyboard layout to macros and line drawing, Kelly gives you not only the keystrokes you need to master WordPerfect but the understanding as well.

CIRCLE 659 ON READER SERVICE CARD



**Mastering Wordstar on the IBM PC**  
By Arthur Naiman  
Sybex Computer Books  
2021 Challenger Dr  
#100  
Alameda, CA 94501  
(800) 227-2346  
(415) 523-8233

ISBN: 0-89588-392-9

List Price: \$18.95

Copyright: Second edition, 1987

**In Short:** A clear and well-organized introduction to WordStar keyboard commands. Short on advanced user applications and thus better suited for beginners. Includes sufficient MailMerge overview.

CIRCLE 660 ON READER SERVICE CARD



**Using XyWrite III**  
By John Sladek  
Osborne/McGraw-Hill  
2600 Tenth St.  
Berkeley, CA 94710  
(800) 227-0900  
(800) 772-2531 (in Calif.)

ISBN: 0-07-881013-2

List price: \$17.95

Copyright: 1987

**In Short:** Using XyWrite III, a comprehensive and well-executed guide, is designed to be used by anyone who wants to learn more about XyWrite's capabilities. It also contains instruction for using XyWrite II Plus.

CIRCLE 667 ON READER SERVICE CARD

(continues)

## How to Get Free Software: The Master Guide to Free Programs for Every Brand of Personal or Home Computer by Alfred Glossbrenner

When the list of unsung heroes of the computer revolution is printed (on a laser, of course), Alfred Glossbrenner ought to get one of the top billings. Repeatedly, in a number of his books, he's shown that some of the best things in computer life are free, or at least inexpensive. *How to Get Free Software* (\$14.95, copyright 1984) systematically weeds through the legions of public domain, bulletin boards, user groups, and other sources of low-cost code.

Glossbrenner separates the chaff from the wheat (the user-supported software I've acquired via his book's advice is quite good) as he shows users how to tap into the vast resources of the user-supported community. Unfortunately, the book, published way back in 1984, is somewhat out of date and DOS users need to sift through the scores of other machines. But, despite its shortcomings, it's the best reference on this elusive subject.

*How to Get Free Software* methodically tours the software bargain basements for all the major brands of computers. It's a referenced testimonial to the body of inexpensive programs that are not only well written, but well supported. The support, as Glossbrenner illustrates, stems in part from the extensive user network.

Glossbrenner shows readers how to "plug into" the various areas where these programs originate and how to find continuing support from kindred users. The book tours the local user groups, the super user groups, bulletin boards, magazines, newsletters, and other often unique (sometimes downright oddball) services that supply low-cost software. Whether it's a library of software purchased from one of the large computer user groups, a gold mine of free software from CompuServe, a freeware package, or a software exchange program, you'll learn how to get at it in this book.

Through references, anecdotes, tips, and pointers you learn to make the most of free software. Getting an equivalent list of addresses and contacts and tips would take

an individual user a lifetime. Highlighted "FreeTipes" appear throughout the book and concentrate on areas that warrant some extra-special know-how. The tips on how to navigate the SIGS on CompuServe and The Source can save seeds of on-line time and money. Glossbrenner is obviously more than superficially familiar with the gamut of public domain, on-line, and user group services for all the PC brands.

Because the book devotes equal time to exhausting the free software resources for all computers (as a matter of fact, far too much of the book focuses on CP/M), IBM users may feel slighted. PC users also won't take well to searching through pages about the Coleco Adam or the Radio Shack TRS-80 to locate their goodies. For the PC user, Chapter 11 pays tribute to the IBM PC freeware/shareware concept—an area

## ■ How to Get Free Software separates the chaff from the wheat as it shows how to tap the vast resources of the user-supported community.

oft ignored by magazine reviews. *PC-Talk*, *File*, and *Write* are looked at in detail, although not in their most current versions. The PC freeware/shareware market has continued to expand, and lamentably many of the more recent additions are not included in this source.

Hence, the Glossbrenner book suffers from the same syndrome as most computer software books: old books tell old news. The timeliness problem is exacerbated for a number of reasons. First, between 1984, when the book was written, and now, low-cost commercially available software has become a reality. The Brown Bags and ButtonWares of the world lessen the attraction for "almost free" software. Second, the typical 64K-to-128K PC in Glossbrenner's book was a simpler one. Today, users running increasingly complicated





# FACT FILE

## PROGRAMMING



### *Peter Norton's Assembly Language Book for the IBM PC*

By Peter Norton and John Socha  
Prentice-Hall Inc.  
Division of Simon & Schuster Inc.

200 Old Tappan Rd.  
Old Tappan, NJ 07675  
(201) 767-9049  
ISBN: 0-13-661901-0  
List Price: \$21.95  
Copyright: 1986

**In Short:** *Peter Norton's Assembly Language Book for the IBM PC* is a new assembly language tutorial offered by one of the best in the business. Although the pace and level of detail are adequate only for beginners, an aspiring programmer who has never encountered assembly language will find this book to be an excellent guide to building a firm foundation.

CIRCLE 684 ON READER SERVICE CARD



### *Handbook of BASIC for the IBM PC*

By David I. Schneider  
Prentice-Hall Inc.  
Division of Simon & Schuster Inc.  
200 Old Tappan Rd.  
Old Tappan, NJ 07675

(201) 767-9049  
ISBN: 0-89303-510-6  
List Price: \$22.95  
Copyright: 1985

**In Short:** A complete reference that describes every BASIC command and gives numerous useful examples; 14 appendices present discussions on graphics, communications, mathematical concepts, file I/O, and more.

CIRCLE 685 ON READER SERVICE CARD



### *The C Programming Language*

Brian W. Kernighan and  
Dennis M. Ritchie  
Prentice-Hall Inc.  
Division of Simon & Schuster Inc.  
200 Old Tappan Rd.

Old Tappan, NJ 07675  
(201) 767-9049  
ISBN: 0-13-110163-3  
List Price: \$26.67  
Copyright: 1978

**In Short:** Coauthored by the developers of the C programming language, this book is a model of its kind. After 9 years it remains the clearest exposition of C features and techniques, offering both a formal definition of the language and a lively tutorial.

CIRCLE 686 ON READER SERVICE CARD



### *Complete Turbo Pascal*

By Jeff Duntmann  
Scott, Foresman & Co.  
1900 E. Lake Ave.  
#B281  
Glenview, IL 60025  
(312) 729-3000  
ISBN: 0-673-18600-8

List Price: \$22.95  
Copyright: 1987

**In Short:** An excellent overview of Turbo Pascal for both the beginning and experienced user, this book covers every aspect of both the CP/M-80 and the IBM PC versions of Turbo (except Turtle Graphics). Can be read to learn the language and then retained as a reference.

CIRCLE 687 ON READER SERVICE CARD

## COMMUNICATIONS



### *The Complete Handbook of Personal Computer Communications*

By Alfred Glossbrenner  
St. Martin's Press  
175 Fifth Ave.  
New York, NY 10010  
(212) 674-5151

ISBN 0-312-15760-6  
List Price: \$14.95  
Copyright: 1985

**In Short:** An excellent and well-written manual on on-line communications that contains a plethora of useful (and occasionally exotic) information.

CIRCLE 688 ON READER SERVICE CARD



### *Mastering Crossstalk XVI*

By Peter W. Gofton  
Sybex Computer Books  
2021 Challenger Dr.  
Alameda, CA 94501  
(800) 227-2346  
(415) 523-8333

ISBN: 0-89588-388-0  
List Price: \$15.95  
Copyright: 1987

**In Short:** A book covering Crossstalk XVI up through Version 3.61. Helpful to intermediate users.

CIRCLE 689 ON READER SERVICE CARD

## NETWORKING



### *Networking IBM PCs*

By Michael Durr  
QUE Corp.  
P.O. Box 30507  
Indianapolis, IN 56250  
ISBN: 0-88022-271-9  
List Price: \$19.95

Copyright: Second edition, 1987

**In Short:** A book for those who want to understand the "what's" but not perform the "how-to's" of PC networking.

CIRCLE 690 ON READER SERVICE CARD

applications need the support that only the commercial houses offer.

Much of the book is severely outdated. I made a few random calls to some of his listings and found only ghosts remained. CP/M, cassette tape storage, and *Softalk Magazine* are but a few of the book's more pronounced anachronisms. A revised edition is desperately needed.

Are the best things in life free? After reading the book I'd conclude that for most folks, free software can never replace commercial applications software. But, if you're hunting for scores of neat utilities, educational games, and short, to-the-point programs that do one particular thing (for example, a bond yield or typing test program), you might find them through

Glossbrenner's book. Equally as important, if you and your computer want to make friends with other users and their computers, this book is a great starting place. So, if you thought the Public Domain was a suburb in the Caribbean, take a look at this book. There's a good deal of good software to be had for (almost) free.—Robin Raskin



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## DOS

### PC-DOS: Introduction to High-Performance Computing

By Peter Norton

No one starts using computers because of a burning desire to learn about disk operating systems. Most mortals are blissfully unaware of operating systems until they try to use a microcomputer and discover the necessity of dealing with the "managing" software. Even users who work with turnkey systems have to format disks and make backups (we hope!). While learning the bare essentials of DOS is absolutely required, standard DOS manuals are very difficult to read. You must have outside help. Peter Norton's *PC-DOS: Introduction to High-Performance Computing* (\$18.95, copyright 1985), the best DOS book on the market, is that help.

Norton's book does not replace the DOS manual. You still need to use the IBM or Microsoft DOS documentation as a reference, but *PC-DOS: Introduction to High-Performance Computing* is a great help when you're just starting to use DOS and when you want help with trickier subjects such as batch files or using DEBUG.

The current edition of Norton's book, published in 1985, covers PC-DOS and MS-DOS Versions 1.0 through 3.1, so it isn't totally up to date (the most recent published version of DOS is 3.21). Func-

■ **Advanced MS-DOS** explores the inner workings of the operating system through C and assembly language.

tions and commands added in 3.2, such as XCOPY, are not included. However, this edition meets the needs of most of the more than 6 million users of IBM and compatible computers. Until Norton updates it, this edition is worth buying both be-

## THE \$30 BIND-IN DISK: WHITE-COLLAR CRIME RETURNS

The same people who set the prices for movie theater popcorn, hotel laundry services, Mercedes replacement parts, stadium souvenirs, and anything at an airport gift shop have infiltrated the computer-book-publishing racket. Too many publishers boost the \$15.95 price of *Turbo Pencil Made Easy* by \$20 or \$30 when they bind in a floppy disk of sample files to save you the hassle of typing in the printed examples.

Now I know publishers are dealing in relatively small quantities, there's a sec-

ond SKU for bookstores to cope with, the author's life is a lonely one, etc. But you'd be hard pressed to find any service bureau that charges more than a dollar apiece for a disk and duplicating these days. Even when you add bind-in charges, a long business lunch at Lutèce where the author and publisher discuss the color of the disk jacket, and a healthy markup, if the price of your book goes up by more than five dollars, call the cops. You've been ripped off.

—Bill Howard

cause of the basic DOS commands covered and because of the way he explains his own use of DOS.

Norton refers to his own uses of computers throughout the book, rounding off the book's technical content with practical tips from his own experience. This technique gives the reader a sense of controlling DOS to get the most from it, making DOS a servant rather than an unyielding master.

The book discusses batch files in depth. It also covers DOS editing commands and using EDLIN. Other parts of the book deal with choosing and using programming languages and applications programs, customizing DOS with CONFIG.SYS, batch files and resident programs, and introductory information on using DEBUG. Throughout the book Norton gives helpful tips and tricks for getting the most from the computer and ways either to avoid potential problems or to lessen their impact should they occur.

Two helpful reference sections appear in the back of the book: one for commands and the other, a glossary. The commands section covers DOS, EDLIN, and DEBUG commands separately. The glossary is in narrative form with related terms defined in paragraphs.

I wish a few topics were covered more completely. Norton does a good job of explaining the BACKUP command but doesn't pay enough attention to RESTORE, the essential command to bring

back data saved with BACKUP. The command VDISK is mentioned several times but is never adequately explained.

Not everyone learns well from books, but for those who do, Peter Norton's *PC-DOS: Introduction to High-Performance Computing* is a must.—Bruce Brown

### Advanced MS-DOS

by Ray Duncan

A programmer's most valuable asset is his collection of reference books. Only the best get added to my own personal library. *Advanced MS-DOS* (\$22.95, copyright 1986), a new offering from the Microsoft Press authored by Ray Duncan, is among the best.

Duncan is better known to many readers as the resident MS-DOS expert and columnist for the venerable *Dr. Dobbs' Journal*. That he has an exceptional knack for presenting complex technical issues in a conversational manner has been established for some time. That talent, combined with the resources available from Microsoft (including a review of the book's manuscript prior to publication by a principal in Microsoft's Systems and Languages Division), qualify this book as one of the most authoritative in its field.

*Advanced MS-DOS* explores the inner workings of the operating system through the mediums of C and assembly language. The book does not profess to be a tutorial



## ■ TECHNICAL SUPPORT

in the languages themselves; rather, it is a thorough documentation of the DOS environment aimed, in Duncan's words, at the "experienced . . . programmer who is already familiar with the architecture of the Intel 8086/8088/80286 family of microprocessors." Unlike many texts, which lack the amount of detail required to satisfy the intermediate- to advanced-level programmer, *Advanced MS-DOS* leaves almost no stone unturned. Yet I would highly recommend it even to aspiring programmers who have a brief knowledge of assembly or C and seek introduction to the underground world of DOS.

The book covers almost every topic commonly associated with MS-DOS programming. Duncan begins with a genealogy of the operating system and moves through an explanation of its various code modules and their functions, the bootstrap loader and DOS initialization, the Program Segment Prefix, executable file formats, and programming tools. The programming tools chapter summarizes the use of the Microsoft Macro Assembler, the Microsoft C Compiler, the LINK, EXE2BIN, CREF, and LIB utilities, and debuggers.

But the most impressive part of *Advanced MS-DOS* is its exhaustive treatment of such specialties as character device programming (keyboard, display, printer, and serial port), file and record manipulation, logical disk structure, memory allocation, MS-DOS filters, and installable device drivers. An entire chapter is devoted to the EXEC function, one of the most powerful and complex services available but one given a mere three pages in the *DOS Technical Reference* manual. The explanation of the Lotus/Intel/Microsoft expanded memory specification and supporting software is second to none. And a detailed summary of the documented DOS functions and the expanded memory manager programming interface (as well as a less-detailed section concerning the PC BIOS functions) serve to make the book the complete reference guide.

In accordance with the belief he expresses that "working, well-documented programs are worth far more as learning tools than are narrative exposition and tables," Duncan complements his discussions with listings in assembly and C rang-

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ing from code fragments to complete utilities. Among the many examples are a functional terminal-emulation program, a DOS shell, and the skeleton of a custom critical-error interrupt handler. A compan-

ion disk that includes all source examples is available through the mail for an additional \$15.95.

*Advanced MS-DOS* is in many respects what the *DOS Technical Reference* man-

ual should have been. Although it was written as a pure MS-DOS resource and generally defers PC-specific topics such as port assignments and hardware, the book deserves a place on the shelf of everyone who has ever given a fleeting thought to programming the IBM PC and compatibles. —Jeff Prossie

# Dr. Dr. Zucker 'Cures'

## A FERARRI OR THE ZUCKERBOARD "FIRST CURE?"

Sunnyvale, CA, May 1987



Using today's high speed personal computers is a lot like driving a 440 horsepower Ferrari on a 55 miles per hour freeway . . . if you go too fast, you get in trouble, hardware and software problems, incompatibility, burn-out, etc..

High speed capabilities are nice to have in reserve, but memory capacity is much more critical in the real world of computing. Accelerator boards are in vogue as a way to speed-up a computer, but they are expensive and can often obsolete your investment in software, add-on boards, and peripherals.

A better way to "soup-up" your computer is to add memory.

More memory means avoiding "memory full" messages on the screen, delays in file sorting, and printing bottlenecks.

How many of you have sat for 15 minutes staring at the flashing red light while sorting a 1.5 meg file? With two more megs of memory to copy the file to virtual disk before sorting, you could sort this same file in four minutes and then copy it back to the hard disk.

Waiting for the printer to finish also wastes time. Printer speed is incredibly slow compared to computer speed. The solution? More memory.

With more memory, you can save a lot of time by putting information you want to print in memory and then have it spool to

the printer.

"The First Cure" (for Slot Phobia), which we discussed in a previous column, provides all the memory you could ever need for an AT, up to nine megabytes in one slot in easy to take doses of 1, 2, 4, or 8 megabytes. The First Cure expansion board provides 128K, of conventional memory to bring your computer to 640K, plus extended memory (IBM type) or expanded memory (EMS) that conforms to the Lotus, Intel, Microsoft (LIM) standard.

The First Cure is a half card that is snapped into another half card, and thus allows you to have all the functions of two long cards in just one slot. My revolutionary snap-together board system starts at just \$99.

The First Cure, like all Zuckerboards, comes with a two year warranty. Best of all, The First Cure never needs to be thrown away. Just trade in the secondary board for credit toward more memory when and if you need it. Isn't this a better approach than having to guess about future memory needs?

There's a saying in the Silicon Valley — if it moves, we don't want it. That's because mechanical devices are inherently slow and wear out. That's what happens to hard disk storage and printers. The best solution is connecting more memory directly to the computer through Direct Memory Access (DMA) with add-on boards, hopefully Zuckerboards. I'm biased.

Note: Dr. Dr. Zucker (Matt Zuckerman, PhD) is President of ATD Inc. of Sunnyvale, CA 235 Santa Ana Court, 408-720-1942.

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## DATABASES

### Understanding dBASE III Plus

by Alan Simpson

Alan Simpson has consistently written the best *dBASE* books published. The current volume, *Understanding dBASE III Plus* (\$19.95, copyright 1986), is the third generation and follows the editions for *dBASE II* and *dBASE III*. Two years ago, when I decided it was time to "really" learn *dBASE III*, I bought every *dBASE* book I could find. Just a couple of chapters into *Understanding dBASE III*, I was hooked by Simpson's style. I use the other books for occasional reference, but whenever someone asks for a first *dBASE* book recommendation, I suggest Simpson.

Simpson is skilled in presenting complicated concepts in an understandable manner. The term "database management system" sounds serious, connoting size, complexity, and significance, but Simpson covers both the beginning essentials and some of the intermediate and advanced uses and techniques with clear language and good examples.

*Understanding dBASE III Plus* does not replace the program's documentation. But because Simpson's book is so very clear, you may find that you use the *dBASE III Plus* manual just for reference. Simpson does not write in strict tutorial form, but you can work along with the explanations for "hands-on" experience of the concepts covered. Simpson sells a \$30 diskette with all the examples in the book keyed in.

*Understanding dBASE III Plus* begins with an overview of database management systems and notes on installing *dBASE III Plus*. After showing you how to use the program's menus and help, Simpson immediately starts designing and building a data file, using both the menu system and



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dot commands. With the sample file built (a list of names and addresses), you go on to learn how to search for records, sort and index, and edit and modify the data and the file structure. The book then covers the last of the simpler functions, creating and printing label and report formats.

Many people never go any further than creating simple reports with database products, and if that's all you want to do with *dBASE III Plus*, Simpson's book will have served you well with the first six chapters. But there are still 300 pages left: 11 more chapters and four appendices. Starting with chapter 7, this book shows you how to use *dBASE III Plus* as the experts do. The advanced topics include designing custom entry screens, calculating with numbers and dates, using multiple tables or files, memory variables, command files and programs, file maintenance, debugging, and design and handling tips. Simpson walks you through designing and coding a complete mailing list system. The appendices cover interfacing with other programs, using *dBASE III Plus's* Applications Generator, a glossary and command reference, and converting *dBASE II* files to the *dBASE III Plus* format.

The only thing wrong with *Understanding dBASE III Plus* is that it can't cover everything about *dBASE*, as no single book can. And if you "get into" the program, you'll most likely buy additional books to pick up other tricks, tips, and solutions to problems. But first, I recommend Alan Simpson's outstanding *Understanding dBASE III Plus*. When Ashton-Tate publishes a new version of *dBASE*, Simpson will probably update this book as well, but today it's still the best one to buy.

—Bruce Brown

### Understanding R:base System V

by Alan Simpson

Microrim's *R:base System V* sports one of the friendliest interfaces in a relational DBMS. Virtually everything from file import/export operations through database definition is either menu-driven or accessible through prompts. And Microrim supplies three well-written and organized manuals that include a tutorial, appropriate examples and illustrations, and an abun-

dance of appendices. Yet if for some reason you find Microrim's documentation too abstract or *R:base's* prompts overly enigmatic, you may find Sybex's *Understanding R:base System V* (\$19.95, copyright 1987) by Alan Simpson somewhat useful.

Intended for the beginner, *Understanding R:base System V* uses the tutorial approach to guide the reader through the basics of *System V's* various commands and modules. Also demonstrated are applications generation, interfacing with other programs, and coding in the *R:base* language. Screen shots, coding examples, and occasional tips appear throughout the book. The 500-page book also contains flowcharts and tables of edit keys and data types, as well as an index and an appendix of *R:base* vocabulary and their functions.

Simpson, who has written other computer-related books, incrementally steps you through the various stages of creating and manipulating a simple mailing-list file. The pacing is extremely deliberate, with many of the steps repeated. In fact, not until the ninth chapter do you expand that mailing list to a two-table database. By the time you have completed the tutorial, though, you have a menu-driven, accounts receivable DBMS complete with error-checking, calculated columns, and data entry and report forms.

On the whole, *Understanding R:base System V* is both well-developed and easy to follow. However, its scope is extremely limited. Except for a small application using *WordStar*, not much of the text really adds to Microrim's own documentation. The section on functions in particular reads almost like an appendix.

Most beginners have trouble designing relational systems and, as a result, their first attempts usually resemble flat files. Simpson inadvertently encourages this ad hoc design approach by skimming over the problems and solutions of relational database construction. For example, rather than explain what tables are and how they differ from the flat files created with other programs, he simply defines his tables and assumes the reader will divine the underlying theory through osmosis.

(You might want to look at Que Corp.'s *R:base System V User Guide*, second edition, by Allen G. Taylor. If it's anything

like its predecessor, the *R:base 5000 User Guide*, it will provide more discussion of database design. And if you're looking for an excellent book on relational database design, you should definitely pick up Addison-Wesley's *Database: A Primer* by C. J. Date.)

Again, *Understanding R:base System V* is a well-written beginner's guide. But if you already have a grasp of fundamental database design and manipulation, this book may not add enough to make even its low cost worthwhile. If you are looking for something that will show you how to juggle two or more pointers, handle nulls, or simulate an exclusive AND, you will simply have to wait until someone publishes an advanced techniques cookbook.

—Vincent Puglia

## SPREADSHEETS

### Douglas Cobb's 1-2-3 Handbook

by Douglas Cobb, with Steven S. Cobb and Gena B. Cobb

Do you remember the scene in *The Wizard of Oz* when Dorothy was in the Emerald City and had an audience before the Wizard? After he gave the command to fetch the Wicked Witch's broom he clamored "Oz has spoken!" and no further discourse was possible. It is with this same authority that another wizard, in another kingdom, has spoken. The new wizard is Douglas Cobb, who speaks through *Douglas Cobb's 1-2-3 Handbook* (\$22.95, copyright 1986) and in his domain, the land of Lotus's *1-2-3*, he has no equal.

*Douglas Cobb's 1-2-3 Handbook* is the second book he has coauthored about *1-2-3* (his coauthors are Steven S. Cobb and Gena B. Cobb). The first, *Using 1-2-3*, published in 1983 and later revised in 1985 for Release 2, very quickly became the *1-2-3* reference book of choice because of its thoroughness and clear explanations on how to operate such a feature-laden program. *Douglas Cobb's 1-2-3 Handbook* goes one giant step further with more comprehensive illustrations, tips that will make you more productive, and notes with helpful hints.

Subtitled *The Complete Guide for Power Users*, this 700-page book has it all. It



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was published in 1986 and although it covers Release 2.01, 1A owners will get just as much out of it. Cobb uses conventions to point out specific enhancements that were made in Release 2 that 1A users can skip. There are over 100 "tips" scattered throughout the book that give you a power user's view on how to use a particular function or command. These range from simple tips, like how to graph discontinuous data, to sublime tips, like Cobb's description of present value analysis on page 151. He even issues words of warning that could only come from someone with years of 1-2-3 usage.

Douglas Cobb's 1-2-3 Handbook can be used in place of the 1-2-3 reference manual. The index is extensive, and each subject is covered exhaustively, although not pedantically. The book isn't perfect, however: it has lots of little typographical errors that might throw you off when you are least expecting it. For instance, in the section that covers formatting a range, the authors are a row short when they select the range. And twice they say the Backslash key is the label prefix for repeating characters. In another section describing a tip to use @ROUND, the text says one thing and the illustration clearly shows something else. These are just little things, but they can cause you some confusion.

Cobb covers all of 1-2-3's features, commands, and functions, and does a particularly good job with macros. He breaks the macros section into two chapters, devoting one chapter to the basics and the other to advanced macros—what he calls the Lotus Command Language. Another chapter covers some of the popular utilities and auxiliary products that have grown up along with 1-2-3. Here the authors mention HAL, Note-It, The Cambridge Spreadsheet Analyst, and Sideways, among others, but merely give descriptions of what these programs do with 1-2-3. I wouldn't recommend using this book as a reference for them.

Recently, Lotus has been positioning 1-2-3 as an operating environment and has made the Developer's Toolkit available to software authors so they can write code that works directly with 1-2-3. Although no products have been released as of this writing, Cobb, always the 1-2-3 visionary, mentions the Toolkit and 4Word from

Turner Hall Publishing, which is expected to be the first program to be released commercially.

Reading Douglas Cobb's 1-2-3 Handbook is like having a good teacher go over your homework: you know the information is in the manual, but Cobb's explanation makes it that much clearer. Once again, Oz has spoken!

—Christopher Barr

### The SuperCalc Program Made Easy

By Chris Wood

As you might expect from its title, *The SuperCalc Program Made Easy*, by Chris Wood (\$17.95, second edition copyright 1987), is aimed squarely at beginners. Wood starts with the assumption that you know nothing at all about *SuperCalc*—not even how to move the cursor. The first three chapters of the book are a 15-lesson tutorial introduction to the program. The 13 remaining chapters delve into progressively more advanced features.

Wood has a rare sense of the steps a newcomer needs to be lead through to grasp each idea solidly. For example, Wood first shows how to add a group of cells by using the formula A1 + A2 + A3 + A4. Wood then shows how to do the same thing more easily by using the SUM function to find the sum of A1 through A4. From there the author introduces the idea of functions in general, then moves on to describing ranges of cells and the possible shapes of a range: rows, columns, a block, or a single cell.

Carefully building a conceptual foundation for the reader, Wood eventually works up to advanced features such as graphics, database management, and macros. Compare this to the *SuperCalc* manual, which includes macros and graphics in its first lesson and can easily overwhelm the newcomer.

Wood writes in a style that confirmed techies often deplore as "chatty," but that mere mortals find much easier to read than the terse explanations of, for example, the *SuperCalc* manuals. The difference in approach is particularly sharp in discussing built-in functions. Typically, in explaining financial functions such as the NPV (net present value) of an investment, the man-

ual offers a bare-bones example of how to use the function. Wood goes beyond that to explain why you might want to use it.

Alas, Wood drops this approach in the last chapters of *The SuperCalc Program Made Easy*. These chapters, which deal with the new features of *SuperCalc4*, were clearly grafted onto an already finished book written for earlier versions of the program. In describing the new built-in functions in *SuperCalc4*, Wood resorts to a list with little more than one or two sentences for each function. In most cases the book gives less information than the manual.

Another problem that grows from grafting a few chapters onto an already finished book is that Wood occasionally says things in early parts of the book that are simply not true for *SuperCalc4*. For example, in Chapter 8 Wood carefully describes a printer setup menu that has been drastically changed in *SuperCalc4*. Such inconsistencies are bound to be confusing.

If you're at all familiar with spreadsheets, you can probably learn *SuperCalc* just as well from the manual. But if you're brand new to spreadsheets and want to learn *SuperCalc4* with minimum strain, *The SuperCalc Program Made Easy* is unquestionably the preferred introduction to the program.—M. David Stone

## WORD PROCESSING

### Word Processing Power with Microsoft Word

by Peter Rinearson

Peter Rinearson's latest edition of *Word Processing Power with Microsoft Word* (\$19.95, copyright 1986) is essentially an update of the original volume, reflecting changes Microsoft made when it produced Versions 3.0 and 3.1 of *Word*. That doesn't make it an insignificant book by any means. First, if you've recently acquired *Word* and want to quickly get the most possible word processing out of it, the book is a "must read," just as the first edition was. Second, the additions and enhancements to *Word*—particularly the built-in outline processor and the index and table of contents capabilities—are significant ones, and Rinearson's book includes tips that will give even the most ex-



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perienced users a powerful head start when learning to use them.

Rinearson is an excellent writer as well as a past master at *Word*, and when he went through his original work with an obviously fine-toothed comb, he thankfully changed only those sections that needed it and left most of the original book intact—even his hilarious chapter on using a mouse to control *Word*. But, besides adding and deleting major chapters to reflect the major enhancements to *Word*, the author was careful to add, delete, and update even the tiniest sections of text to reflect the myriad of small changes that Microsoft's gnomes have also made to *Word*.

For example, Rinearson's excellent chapters on *Word*'s merge and style sheets are virtually unaltered. However, the chapter on footnoting was eliminated because the tricks in the first edition of the book have been supplanted by *Word*'s built-in index feature. Rinearson added whole chapters to guide you through using the built-in outline processor, generating indexes and tables of contents, and using the program's new table manipulation and side-by-side paragraph features. At the same time, small details, such as the program's new-found ability to print glossaries, are mentioned in the book, along with Rinearson's usual array of tips about how and why to use them. One weak point is the new chapter on using search and replace: the old tricks are no longer necessary to learn, but the new ones Rinearson shows you aren't especially powerful or even unique to *Word*.

Rinearson's chapter on outlining is particularly satisfying. He gives a useful example, shows you some neat tricks about how to use the outline feature to force *Word*'s paragraph numbering feature to do some things it ordinarily wouldn't do, and, most important, demonstrates how a professional writer can become more productive using the outline feature. His chapter on hidden text and generating indexes and tables of contents is equally good, partly because it is so realistic about *Word*'s limitations, as well as its capabilities, in these difficult areas. The tricks you learn—such as how to generate "see also's" in your index—are well worth the price of the book.

Rinearson is also realistic about *Word*'s other limitations. He emphasizes the need

for high-performance equipment, such as a PC AT and an EGA or Hercules monitor, if you're going to get the most out of the product. He also advises you on how to use resident programs that aren't compatible with *Word*'s graphics mode, and he spends a good deal of time suggesting ways to use a keyboard macro (with examples oriented to Rosetsoft's *ProKey*) to reduce keystroking chores.

Unlike a lot of "how-to" computer books, *Word Processing Power with Microsoft Word* is not a rehash of, or even an improvement on, the user manual. It's a thorough, well-written writer's guide to a writer's power tool. Don't use *Word* without it.—**John Dickinson**

### Mastering WordPerfect

By Susan Baake Kelly

No *WordPerfect* book has prevailed as the one, indisputably superior learning aid. The *WordPerfect* bible should be comprehensive, covering in sufficient detail all topics from keyboard arrangement to macros and mail merge. It should be well-organized so that you can quickly locate the material on a given topic and glean from it what you need. Finally, it should be clearly written and appealingly designed. *Mastering WordPerfect*, by Susan Baake Kelly (\$19.95, copyright 1986), meets these criteria better than the other books we evaluated (see "Seventeen Ways to Learn *WordPerfect*," Volume 6 Number 7, for an overview of books on *WordPerfect*).

*Mastering WordPerfect* has three parts: fundamentals, advanced word processing features, and supplemental features. Kelly designed Part 1 as a tutorial to get *WordPerfect* users on their feet fast. The remainder of the book was intended to be more of a reference guide.

Beginning with a section on The Keyboard and Basic Editing and ending with Block Operations, Part 1 leads you gently but quickly through all the features you need to use. Kelly manages to teach the fundamentals of *WordPerfect* painlessly—including tricky topics like the Reveal Codes function—through creating and editing several short letters.

In Part 2 Kelly plunges deeper into formatting features and introduces some of

*WordPerfect*'s more powerful features, such as automatic index and table of contents generation.

Part 3 rounds out the main body of the book with the power features you need to get the most out of *WordPerfect*: merging, math, sort and select, macros, and line drawing.

The appendices include a *WordPerfect* installation guide, a list of commands, and an introduction to *WordPerfect*'s companion products, *WordPerfect Library* and *MathPlan*. You'll find a thorough index at the back of the book and a large pullout that maps *WordPerfect* commands to the appropriate keys.

*Mastering WordPerfect* offers quite a few tidbits of information you won't find in the *WordPerfect* manual, such as how to perform copy, delete, and print operations on multiple files from the List Files screen, and Kelly encourages good user practices by explaining concepts and shedding light on how the program actually works. For instance, instead of simply urging you to exit the program before you turn off your machine, Kelly explains that only by properly exiting *WordPerfect* will you clear away *WordPerfect*'s overflow files from your disks—a tip that should cure you of simply powering down when you've finished work.

The book's large type, uncluttered page layouts, and large screen illustrations are appealing and easy on the eyes, and frequent subtitles break chapters into sections so that you can quickly find what you need. Moreover, you won't turn to a specific chapter for information only to find that you must read the preceding chapters first. Aside from Part 1, each chapter consolidates the information you need on a given topic to get you up and running as soon as possible.

*Mastering WordPerfect* doesn't treat *WordPerfect*'s power features with the same depth as do two other books we evaluated in issue 7 (*Advanced WordPerfect: Features and Techniques* by Eric Alderman and Lawrence J. Magid (Osborne/McGraw-Hill) and *WordPerfect Tips and Tricks* by Alan R. Neibauer (Sybex)), but for a combination of sheer friendliness, clear explanations, and well-rounded coverage of features, *Mastering WordPerfect* is hard to beat.—**Mitt Jones**



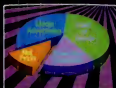
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### Mastering WordStar on the IBM PC

By Arthur Naiman

Arthur Naiman's *Mastering WordStar on the IBM PC* (\$18.95, second edition copyright 1987) is a clear and well-organized introduction to the word processor that many of us hold so dear. In fact, it is the offspring of a 5-year-old book that first helped CP/M users figure out MicroPro's keyboard hieroglyphics and which, revamped for the IBM PC, remains somewhat of a computer book classic.

However, with this edition, the book has been deceptively renamed (from *Introduction to WordStar*). Despite its many years in print, it still delivers little in terms of "mastery" and serves instead as a readable manual to *WordStar*'s clandestine keyboard commands.

Writers who want to scout their cursor screen and shuffle their documents like cardsharks—using BASIC patches and *SuperKey*-type customization—will find that this book falls seriously short. Those who want to delve deeper into *WordStar* esoterica will find *Underground WordStar* by PC Magazine editors Paul Somerson and Stephen Manes (Hard/Soft Inc.) or *WordStar Tips and Techniques* by Robert Wolenik (Scott, Foresman & Co.) more appropriate buys. (An expanded version of *Underground WordStar* is now a part of the new *StarFixer* package; see the sidebar "But Is It Really WordStar?" in "Major Word Processors Get Better," in this issue.) Though Naiman does offer an occasional shortcut (i.e., how to open a file directly from the A prompt), as well as a good description of options for saving files on an already overloaded diskette, there is not enough to justify this book for anyone who has already erased their Help screens.

The chapters and outline are generally complete, quickly covering all the basics and then following through with more-detailed descriptions once the reader is up and running his disks. However, Naiman gives no program installation guidance—an especially sore point, since this topic is poorly handled in *WordStar*'s own text, and a good discussion of it could provide users with invaluable ideas about program modification.

In total, the author devotes only 108 text pages to *WordStar* itself. The longest

chapter is devoted to *MailMerge*, supplying a working knowledge of this clunker of a program that has caused many *WordStar* adherents to look elsewhere for form letter and labeling functions. And the book is otherwise puffed up with a chapter on the MicroPro spelling checker, *CorrectStar*. Surprisingly, there's nothing about advanced user applications.

In general, the volume does serve as a decent adjunct to the convoluted *WordStar* manual that has baffled millions by now. Naiman knows his *WordStar*, and he presents it economically and with the authority of someone who uses it daily. Unfortunately, the narrative shows no passion for the raw power of the program that has endeared it to so many users, nor does it offer any criticism of its quirks and shortcomings (i.e., lack of an Undo command, and no Auto-save feature). Moreover, its cost-per-revelation rate is extremely low—a rate of 17.5 cents per page, although a wall poster of key commands is a nice perk.—**Martin Porter**

### Using XyWrite III

By John Sladek

Many devoted users consider *XyWrite* a fast, versatile, and powerful word processing program. An abundance of sophisticated features make it an excellent compositional tool. But the documentation included with *XyWrite II Plus* is so poor that it is nearly impossible to access all of the program's wonderful features. Thankfully, *Using XyWrite III*, by John Sladek (\$17.95, copyright 1987), provides instruction for operating *XyWrite II Plus*, as well as *XyWrite III*.

XyQuest, the people who produce *XyWrite*, have responded to the demand for more-comprehensive documentation by including a very complete set of manuals with *XyWrite III* (Installation Guide, Quick Start Tutorial, Basic Word Processing Tutorial, Applications Tutorial, Reference Manual). Even so, John Sladek's well-designed and comprehensive guide for learning the techniques necessary to master the power of *XyWrite* proves to be more efficiently organized than the manual. And it is especially valuable for *XyWrite II Plus* users.

*Using XyWrite III* is designed to be used as a learning tutorial for users of varying familiarity with *XyWrite* and, once you are a power user, as an easy-access reference manual. It includes 18 chapters, divided into five parts according to how the commands and operations are used, and three appendixes. Features available only in *XyWrite III* or only in *XyWrite II Plus* are consistently differentiated throughout the book.

The first part teaches you the basic techniques needed to begin word processing with *XyWrite*, including starting up the program, simple file operation commands, basic editing skills, screen formatting, and designing the printed page. I found that the installation procedure for *XyWrite III*, Version 3.1, deviates drastically from that described in the "Getting Started" chapter of the book. I would strongly recommend that first-time users of *XyWrite* skip this chapter of the book and follow the instructions given in the *XyWrite III* Installation Guide and Quick Start Tutorial.

Power techniques, such as search and change commands, manipulating a block of text, and use of windows are covered in the second part. These chapters describe the commands in detail, although it seems to me that the chapter covering block operations would have been better positioned following basic editing skills.

Part 3 describes the use of *XyWrite*'s extensive printing capabilities. Creating footnotes, indexing, table of contents, columns, chain printing, boilerplate, and forms are described. I found the tutorials supplied with *XyWrite III* to be more comprehensive than this section of the book.

*Using XyWrite III* really becomes a worthwhile supplement to the *XyWrite III* manual in the last sections of the book. Part 4 describes programming in *XyWrite*, as well as math and non-keyboard character generation. By programming in *XyWrite*, you can build new features that really allow you to use the power of *XyWrite*. In addition to giving you the basics of using *XyWrite*'s programming language, sample programs are included. Once you have mastered *XyWrite* programming, you may want to try using XPL (Extended Programming Language), *XyWrite*'s advanced programming language.

Tailoring *XyWrite* to meet your particu-



## ■ BOOKS FOR TECHNICAL SUPPORT

lar needs is the subject of the fifth part of the book. Complete instruction for changing start-up and help files, customizing your printer file, and extending the keyboard is found here. Appendix B contains sample help screens, which you can copy into your existing help files or use as additional help files. The help screens are arranged by use, in the same manner as the organization of the book.

Appendix A lists error messages and it includes some nonerror messages as well. I also liked Appendix C, which consists of command summaries, again organized by use. This is where you can easily find that command you just can't seem to recall. But it doesn't contain any information not available on the *XyWrite III* Quick Reference Card.

Using *XyWrite III* will help users of *XyWrite II* Plus to finally access the wealth of features the program supplies. And though *XyWrite III* users will probably find the manuals included with the program sufficient, they may find John Sladek's a welcome supplement.—**Catherine D. Miller**

## PROGRAMMING

### **Peter Norton's Assembly Language Book for the IBM PC**

*By Peter Norton and John Socha*

Peter Norton is well known as the creator of *The Norton Utilities*, as a distinguished author with several PC-related books to his credit, and as an accomplished assembly language programmer. His latest work, *Peter Norton's Assembly Language Book for the IBM PC* (\$21.95, copyright 1986), departs from the standard established by his earlier ones and serves as a tutorial rather than a reference guide. Coauthor John Socha, a colleague of Norton's and the programmer behind *The Norton Commander*, lends a hand to make this one of the better texts from which to learn assembly language.

Norton's *Assembly Language Book* is designed especially for the user or aspiring programmer who has no previous experience in assembly. Chapter 1 begins with an explanation of hexadecimal numbers and 2's complement integer notation. Common assembly language instructions

such as MOV, INT, DIV, and MUL are introduced one at a time and put to gainful use through short routines written and executed from within DEBUG. Interrupt 21h is presented as a means of reading and writing characters. DEBUG becomes the student's eyes and ears into the machine; the authors go to great pains to ensure that a solid understanding of each new instruction is built before moving on to another.

The *Assembly Language Book* builds on this humble foundation by introducing the macro assembler and the concept of modular programming. The segmented universe of the 8088 and its ramifications to the programmer are outlined. The book explains the differences between the COM and EXE executable file formats as it prepares the reader to weave his numerous threads of knowledge into the fabric of a working program.

The heart of the tutorial lies in the development over a period of several chapters of a highly modularized utility called DSKPATCH (for Disk Patch). DSKPATCH reads data directly from disk sectors through interrupt 25h, displays it on-screen in a format similar to DEBUG's Dump command, and then allows the user to edit individual bytes and write the modified sector back to disk. By itself, it's a useful utility. But its real value is in seeing it develop from a few meager lines of code into a full-blown application. Norton and Socha document every step and carefully explain every encounter made along the way. The reader learns how the ROM BIOS video routines can simplify his programming tasks and why experienced programmers might zero a register with XOR AX,AX instead of MOV AX,0. The program is implemented in the form of several ASM files with cross-referenced procedures and memory locations. Separate modules are stitched together at link time. The complete source code with enhancements is available through the mail for an additional \$24.95.

Programmers already familiar with assembly language will find *Peter Norton's Assembly Language Book for the IBM PC* too slow-paced. That's not the audience this book was intended for. The beginner who works his way through it will be well prepared to tackle additional programming challenges with the aid of reference texts

that supply further details concerning DOS and BIOS services. If you're new to the programming field and want to explore the world of assembly language, pick up a copy of this book.—**Jeff Prossier**

### **Handbook of BASIC for the IBM PC**

*By David I. Schneider*

Though BASIC has been discussed in thousands of books, the revised edition of *Handbook of BASIC for the IBM PC* (\$22.95, copyright 1985) must be one of the most complete and thorough books on the topic. Unlike the BASIC manual that comes with most PCs, this book goes into considerable detail as it explains every command and function. And though it is arranged pretty much as a reference book—with each statement listed in alphabetical order—many of the descriptions are really complete "mini-chapters" in their own right.

For example, the discussions about PRINT and PRINT USING span 17 pages, covering printer setup strings and formatting, printing to disk files, as well as a number of PRINT USING's lesser-known features. DEF FN and OPEN COM, two other commands that are difficult for beginners to grasp, are explained both clearly and thoroughly.

The DRAW and PLAY statements further illustrate the book's depth. In ten pages the author carefully describes all of PLAY's intricacies, using a drawing of a piano keyboard to show how the various notes and octaves relate to the commands that are used. Even more pages are devoted to DRAW's many options, which, like PLAY, are actually a complete language.

A thorough treatment is given to accessing the environment from within BASIC and controlling device drivers using IOCTL, and an excellent (and needed) discussion is presented on using the reserved variables ERDEV and ERDEV\$. These are only minimally explained in IBM's documentation, which talks mostly in terms of interrupts and then refers the reader to the *DOS Technical Reference manual*. A number of tutorials are presented in the various appendices that cover communications, graphics, and reading and writing disk files. Again, these topics are bare-



## ■ BOOKS FOR TECHNICAL SUPPORT

ly mentioned, if at all, in the PC's BASIC manuals.

A few subjects are not covered as well as I would have liked, though, and in some cases are simply not clear at all. For exam-

ple, in the section on the ASC function, the author appears to state that it was created specifically to allow a quote (") to be assigned to a string, which, of course, is not true. Further, some of the examples are

presented in purely mathematical terms, when such a heavy-handed approach isn't really necessary. Particularly clumsy is the description of how numeric variables are stored in the PC's memory. From the section on VARPTR:

"If n is an integer from 0 to 32767, then n can be written in the form  $n = r + 256 * q \dots$ "

At nearly 600 pages, *Handbook of BASIC for the IBM PC* is a big book indeed. And though the author stops short of calling it a tutorial for beginners, it could actually serve in that capacity quite well. The only prior knowledge really required is an understanding of what a program is, and some familiarity with BASIC's most elementary instructions. But the book serves intermediate and expert programmers, too. Though I've been programming in BASIC for years, several times I found myself thinking out loud, "Gee, I didn't know that!"—Ethan Winer

### The C Programming Language

By Brian W. Kernighan and Dennis M. Ritchie

A book published in 1978 might seem much too ancient to still have relevance for IBM PC programmers, but *The C Programming Language*, by Kernighan and Ritchie (\$26.67, copyright 1978), is an exception to all the rules.

Referred to by programmers simply as "K&R," this 228-page book is a concise, clear, well-written text on what has become the language of choice for PC program developers. K&R is the authority on C. Arguments about the language are immediately resolved when somebody starts off a sentence with the words "K&R says. . ." Even well-experienced C programmers periodically reread K&R and almost never come away without learning something new.

Dennis Ritchie invented C, and *The C Programming Language* reflects an intimate familiarity with technique and rationale. The book teaches C by presenting and building on numerous programming examples that show concise, clear C code in all its economical glory.

The simplicity of the prose mirrors the code. K&R is written in a simple, easy, re-

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laxed style revealing a crystalline clarity of thought and expression. When reading *K&R*, you're in the presence of people who know exactly what they're talking about and how to say it.

C programs are considered to be highly portable between systems, but this feature requires the programmer to be aware of the differences between the formal language specifications and what depends on the particular implementation. *The C Programming Language* was written after C compilers had been developed for several minicomputers and mainframes, so it is a practical as well as a theoretical book. Throughout *K&R* are numerous warnings concerning implementation differences, the most famous being the section with the title "Pointers Are Not Integers."

*The C Programming Language* describes a bare-bones minimum C—the lowest common denominator of all C implementations. If you are familiar with other programming languages, *K&R* is the best place to learn the rudiments of C. By presenting the basic language, the book helps to clarify the differences between the elements of C that are common to all implementations and the enhancements that have added to C compilers in various environments over the years.

But *K&R* is not the book through which to discover how to fully exploit the wealth of library functions provided with modern C compilers. The concept of a "standard library" for C has grown immensely since 1978 and now includes scores of string manipulation, file I/O, and floating-point math functions not covered at all in *K&R*. Complement your reading of *K&R* with another book on C whose author has programmed on the IBM PC using the same C compiler that you intend to use.

The future of C is now in the hands of an American National Standards Institute (ANSI) committee. Although the ANSI C standard is still a year or two away from being finalized, one hears more talk these days about "ANSI C" than about "K&R C." Still, I don't expect *The C Programming Language* to fade into obscurity after its authority has been superseded. The language itself may be improved, but it's hard to imagine anyone improving upon Kernighan and Ritchie's classic text.

—Charles Petzold

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## ■ BOOKS FOR TECHNICAL SUPPORT

### **Complete Turbo Pascal**

by Jeff Duntemann

*Complete Turbo Pascal*, by Jeff Duntemann (\$22.95, second edition copyright 1987), is the textbook everyone wishes he had when he was first learning the Turbo Pascal language. Not that the Borland manual that comes with Turbo is bad, mind you, but few books rise to the level of Duntemann's best effort. This second edition has been enlarged over the already successful earlier edition to include the Version 3.0 extensions to Turbo Pascal. In addition, many of the program examples have been improved.

In living up to its name, *Complete Turbo Pascal* does not play favorites, giving the CP/M-80 and IBM PC versions of Turbo equal billing. Of course, most of the example programs run equally well with either version, but in the cases where this is not true, Duntemann is careful to point out the differences. In the discussion of IN-LINE assembler code, for example, Duntemann discusses both the 8088 and the Z80 assembler interface to Turbo. He also devotes a separate chapter to the 8087 and the BCD versions of PC Turbo.

*Complete Turbo Pascal* is written primarily to be a reference book with a detailed table of contents and a thorough index. Duntemann tends to discuss every aspect of a topic in a separate section before moving on to a new topic in the next. That does not mean that you cannot read *Complete Turbo Pascal* cover to cover.

Duntemann's style is informative but light, rarely falling into didactic lecturing. Although the book is not too difficult for the beginner, it does not dwell so long on the topics that the more experienced reader becomes bored. The example programs are well chosen to demonstrate the salient points of each discussion.

*Complete Turbo Pascal* covers the Turbo Pascal language and the Turbo environment. Special sections are devoted to the use of the editor and the compiler itself. Duntemann points out deviations of Turbo Pascal from the ISO standard. This is important if the writer wants his code to be portable to other systems.

The one topic Duntemann omits is that of *Turtle Graphics*, Borland's graphics

package included with Version 3.0 of the PC version of the compiler. This omission is intentional, as Duntemann states in his introduction that he considers *Turtle Graphics* to be "a very bad idea." This omission is probably not significant anyway, as I have never seen *Turtle Graphics* used by anyone but Borland itself.

Finally, just as important as the book's discussions of Turbo Pascal are its discussions of the "art" of programming. Duntemann obviously feels that at least 50 percent of the work of programming should be done before the first line of code is written, especially in a rigidly structured language such as Pascal. Duntemann rebels vigorously against BASIC's style of "think as you go." In these days of ever-escalating software costs, this lesson is critical for anyone who takes programming seriously.

All the example programs in the book appear in an appendix as Cauzin Soft-Strips. Duntemann has also either put them into the public domain or made them available from him for a negligible fee.

Overall, I can find little to fault in *Complete Turbo Pascal*. It is highly readable, complete, and accurate—an unbeatable combination in anyone's book.

—Stephen Randy Davis

## COMMUNICATIONS

### **The Complete Handbook of Personal Computer Communications**

By Alfred Glossbrenner

It is always discouraging when a good resource becomes badly out of date—a situation that occurs much too often with literature dealing with computers. Therefore, I was pleasantly surprised to find a brand-new, completely revised edition of Alfred Glossbrenner's excellent book on electronic communications, *The Complete Handbook of Personal Computer Communications* (\$14.95, copyright 1985). The first edition, published in 1983, was a thorough introduction to on-line communications. The updated 1985 edition has been almost totally rewritten, and it includes an amazing amount of important, useful, or merely interesting information.

Part of the book's superiority lies in its

style and organization. Glossbrenner is a clever, interesting author who assumes that his readers are reasonable, thinking adults (rather than the somewhat slow children that many technical writers seem to address). He does not begin with the painstakingly simple explanations of data transmission that other communications handbooks seem to consider necessary. Instead, Glossbrenner lays out exactly what topics are covered and where the reader should go for specific information; and while he does provide all necessary technical data, he makes it quite clear

■ *Complete Turbo Pascal* is the textbook everyone wishes he had when he was learning the language.

whether the information is necessary to the everyday user, or whether it is more useful to a systems operator.

*The Complete Handbook of Personal Computer Communications* has six separate sections. The first, Accessing the Power, begins by offering a general survey of what is out there, followed by specific advice on hardware, software, how to understand the technology of communications, and a few hints on how to make the most of your equipment. The next section, The Online Utilities, deals with specific services such as The Source, CompuServe, and Delphi. Section 3 handles business, financial, and investment services such as Dow Jones and NewsNet, and Section 4 describes the various e-mail and conferencing systems. Finally, the vast underground network of bulletin board systems and the new home-office interface are discussed in Section 6. There is also a complete glossary and index.

The *Handbook* seems to be organized with browsers in mind. Each subtopic is clearly headed both in the table of contents and within the text; there are frequent listings containing the names, addresses, and phone numbers of various services and resources, and examples of on-line dia-



## ■ TECHNICAL SUPPORT

logues with various services. My favorite sections are the on-line tips that Glossbrenner has sprinkled throughout its pages. These are boxed-off sidebars filled with highly specific information on such topics as phone numbers that can be called for information about specific systems, hints on when it is actually an advantage to use 300 bps, or advice on how to avoid paying for junk mail on The Source. In fact, when I came across Glossbrenner's book, I spent several minutes just flipping through and scanning his tips to catch anything that could help me in my own communications work.

Incidentally, fans of Glossbrenner's previous edition should not hesitate to lay out the \$14.95 for the newer book. It contains so much information and is so well-written that it is an asset to anyone's library.—Barbara Krasnoff

### Mastering Crosstalk XVI

By Peter W. Gofton

Learning telecommunications can be a serious pain. Unlike applications programs, you're dealing with two computers instead of one, as well as the modems and cables connecting them, so more can go wrong. That's why a good telecom program is integral to good communications. Microstuf's *Crosstalk XVI*, the subject of Peter W. Gofton's *Mastering Crosstalk XVI* (\$15.95, copyright 1987), is that program. *Crosstalk XVI* is powerful, slick, and dominates its market with 23.5 percent of the PC market pie. Let's face it, 500,000 users can't be wrong.

But *Crosstalk XVI* also isn't the easiest package in the world to use. How could a communications novice, or even users weaned on other less versatile programs, possibly know that "GO LOCAL" is how to get into terminal mode unless they flip endlessly through the manual? I'll admit *Crosstalk XVI* has a good manual, but it needs some second-tier support to make operations a little more palatable to the uninitiated.

For users in a limbo stage between beginner and expert, *Mastering Crosstalk XVI* could be the answer. It is full of answers to such questions as: What, actually, is flow control? How do I download a file

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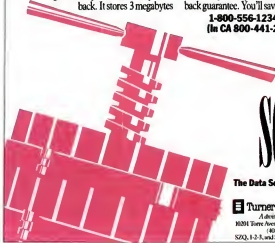
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using XMODEM? How do I program those function keys? More advanced users will appreciate the chapter for programmers explaining how to generate script files in BASIC and how to use *Crosstalk*

XVI's DEBUG command to see control characters or receive data as hexadecimal digits. I mean, I never before knew how to convert characters to uppercase in *Crosstalk XVI* (UONLY ON or OFF).

The book is well produced, with photographs, thin margins for writing notes, and helpful photographs of *Crosstalk XVI*'s screens. The only piece of art, reproduced at the beginning of every chapter, is a three-dimensional cube floppy disk with cables coming out the middle, looking somewhat like a low-budget horror show monster.

The author presents *Crosstalk XVI* in five sections: Setting up your System, Preparing for Data Transmission, Sending and Receiving Data, Automating *Crosstalk XVI*, and Using *Crosstalk XVI* with Information Services. Each section is subdivided into three or four chapters on each topic. There is a helpful index and a glossary full of communications terms foreign to beginners. The author also devotes chapters to accessing CompuServe, The Source, and Dow Jones News/Retrieval.

*Mastering Crosstalk XVI* shines for its little gems. But these are also diamonds in a rough text. I can't recommend this book to beginners. The reason first-time product users buy books on how to use a program or peripheral is because the manual was unhelpful, confusing, or too technical. Goffon's book doesn't bridge these gaps. He doesn't have a hand-holding quick start section to help the novice get on- and off-line quickly and easily. Instead of presenting a sample session for the bare-bones beginner to follow so he can make a call immediately, he presents *Crosstalk XVI* commands in a fragmented form—much the way the *Crosstalk XVI* manual does. But the *Crosstalk XVI* manual also has a section near the beginning, pulling the tyro by the nose through that first phone call.

Meanwhile, in *Mastering Crosstalk XVI*, you learn about such things as dialing a number with the Go command in Chapter 5—long after your arm has tired from turning pages. Goffon's scripts are a slight help, but only if you subscribe to CompuServe, The Source, or Dow Jones News/Retrieval.

I snored through the first three chapters on installing modems, serial cables, and copying and starting *Crosstalk XVI*. All this information should have been condensed into one smaller chapter, and, at any rate, the *Crosstalk XVI* manual presents it well.

The author also seems concerned with

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making mistakes and misleading readers, so his text is full of disclaimer notices like this one: "The sample command and script files I have given, especially in Part 5, cannot be relied upon to remain usable, since the information services may change their command structures."

Ok, dokey. We all know that the computer business is constantly changing, and it's true that inevitably there's yet another way to perform a function in a program as complex as *Crosstalk XVI*. But these contingency notes are just the kind of thing to drive a sane beginner over the edge to paranoid frenzy. Another example: the author notes that you have to have a "true compatible" instead of just a compatible, and warns that "some of these computers aren't so compatible in the area of communications." But, unfortunately, he doesn't provide a helpful list of major clone manufacturers that are compatible, so a new Leading Edge owner has to call Microstuf to find out if his machine is truly worthy of *Crosstalk XVI*.

Beginners aside, the book has tips that even an expert might not have found out about. Those already familiar with *Crosstalk XVI* will find *Mastering Crosstalk XVI* useful. Other folks, hold on to your money.

—Christopher Johnston

## NETWORKING

### Networking IBM PCs

By Michael Durr

Michael Durr's *Networking IBM PCs* (\$19.95, second edition copyright 1987) is a book about networking PCs, not a book on how to network PCs. Designed for information system managers and experienced operators of single-user PCs who want to understand PC networking, the book supplies an objective view of what a Local Area Network (LAN) system should be. Durr gives his reader the LAN picture from a user's perspective, emphasizing the most relevant factors and problems associated with setting up and maintaining a network system.

*Networking IBM PCs* does a good job of defining what a LAN system is for and what its pieces are. The discussion goes from the general to the specific, starting

with the complete LAN system: its advantages, disadvantages, and functions. It then covers each component, from the cables to the Network Interface Cards (NIC) to the Network Operating System (NOS). The author uses existing products on the market to help get his points across, thus establishing a good mix of theoretical and real-world analysis. He points out the current extent of the technology and the func-

### ■ *Networking IBM PCs* helps to clear up the web of intricacies in the LAN planning process.

tionality of each LAN component as well as its most common and documented limitations and problems.

*Networking IBM PCs* is both informative and easy to read. An index and table of contents are included. You don't need to be expert in DOS, DBMS, or computer hardware to be able to understand *Networking IBM PCs*, yet the book assumes that you have a good understanding of the different components and the interfaces between them.

The information in the book's 186 pages is divided into four general sections. The first section provides a data communications overview, starting with a brief history of networking. It discusses Private Branch Exchanges (PBXs) as an alternative to more commonly used PC networking systems. It concludes with a discussion of the International Standard Organization's (ISO) Open System Interconnect (OSI) model and how this and other "standards," such as DOS 3.1 and NETBIOS, brought at least temporary stability to the LAN software market.

The next section deals with the various components of a LAN system. The topics included cabling, the processing and compatibility characteristics of NICs, and the advantages and disadvantages of file and communication servers. On the software side, *Networking IBM PCs* covers the more common functions and capabilities

of networking software. Durr uses a list of operating system commands to compare what he identifies as the three major network operating systems: Novell's *NetWare*, 3Com's 3+, and IBM's PC LAN. His information is current and relevant.

The third section is of particular interest to the managers who will depend on networks to get their jobs done. It describes the complexity and broadness of the LAN market. Major topics include LAN evaluation, management, maintenance, and diagnostics, application software compatibility, security and data protection strategies, cable installation, and performance monitoring. But again, *Networking IBM PCs* describes a few factors relating to diagnostics, installation, and monitoring; it really doesn't tell you how to diagnose, install, or monitor.

The final section focuses on LAN expansion via interconnecting and/or mainframe connections. It also covers the value of inter- and intra-network electronic mail.

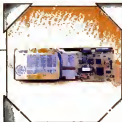
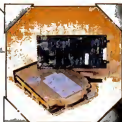
Durr stresses that good planning is as important as the quality of the network hardware and software in planning a LAN. LANs are inherently complicated, and *Networking IBM PCs* helps to clear up the web of intricacies in the LAN planning process.

For a book designed for the network planner choosing an information transfer system, I found *Networking IBM PCs* lacking in that it failed to mention the other LAN alternatives such as multiuser systems, master-slave PCs, RS-232 LANs, and other cost-effective and practical systems. The section on "Choosing a Network Manager" didn't mention what I consider to be a basic requirement for anyone establishing and maintaining PC-based LANs: a strong knowledge of DOS. The book also failed to mention batch files, the primary tool of the real network manager. These flaws aren't fatal, but the failure to at least explain the role of batch files and the amount of work involved in maintaining and creating them is serious.

*Networking IBM PCs* is a good book for those who want to learn some of the background and buzzwords of PC-based networking. It doesn't answer questions of "how to?" but it does answer those of "what is?" clearly. —Roberto Rivera



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■ PC LAB NOTES: 1-2-3-TYPE MENUS ■ ROBERT L. HUMMEL

# DESIGNING MENUS À LA 1-2-3

*You can provide your applications programs with a Lotus-style interface by using the files MAKEBAR produces with the SLASHBAR utility in the Programming/Utilities column.*

**B**oth PC Lab Notes and the Programming/Utilities column in this issue are devoted to showing how to add a Lotus-like control menu to your existing applications programs. PC Lab Notes shows you how to construct menus for your applications that will work with the standard interface presented in Programming/Utilities. Part 2 of Ethan Winer's examination of Turbo BASIC will appear in the next issue.—Craig L. Stark

Wouldn't it be nice if all your applications had been designed to use the same Lotus-style command interface? It would certainly simplify learning new programs, and it would go far toward eliminating the traditional conflict between the command-oriented and the menu-driven workers in your office. -

You can't do much about the control structure of an existing program, of course. But what you *can* do is outfit that program with a pop-up shell that executes the program commands in a way that looks and feels as familiar as the Slash-key-activated menu in 1-2-3. Hard-core users can then run the program without ever calling up the Lotus-like slashbar menu. But for those who want it, a standard, easy-to-use executable menu interface is only a key-stroke away.

SLASHBAR.COM, the program that superimposes the pop-up control menu over your applications program, is presented in this issue's Programming/Utilities column. This article covers the design and construction of menus that are suitable

for SLASHBAR.COM to use.

Since you will want to use the same standard interface program to implement the command sets of a variety of existing software applications, I've devised a uniform procedure for menu preparation. This involves not only organizing menu choices in a logical way, but putting them in a simple block-structured format. The files you prepare are then compiled into the form required by SLASHBAR by running them through MAKEBAR.COM, a program which will be presented here. Each step of

the procedure will be illustrated by constructing a working 1-2-3-style shell for a number of DOS commands. That way you can see exactly how to implement the command set of your favorite software applications.

**DOWNLOADING** The easiest way to get your own copy of MAKEBAR is to download it via modem from the PC Magazine Interactive Reader Service, as explained in the accompanying sidebar. You may, however, wish to type the listing in yourself. The assembly language listing is shown in Figure 1, and a BASIC program that will create MAKEBAR.COM when you run it once is shown in Figure 2. The sample DOS menu file, DOS.BDF, is shown in Figure 3.

Once you have obtained MAKEBAR.COM, you use it to compile the menu file you prepare with the following syntax:

```
MAKEBAR [path]input_file [path]output_file
```

The input\_file must be a Bar-menu Definition File similar to the sample DOS menu file (DOS.BDF) shown in Figure 3. (You do not have to use the specific extension .BDF, although following the discussion below will be easier if you do.) The output file will be a compiled version of the input and is usually given a .BAR extension. Both DOS.BDF and DOS.BAR are also available for downloading from PC-IRS. If MAKEBAR encounters any problems in compiling a menu file, an error message and line number will be displayed.

## PRODUCTIVITY INDEX

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## PRODUCTIVITY

### PC LAB NOTES

**MAKING A MENU** To facilitate the explanation, I'll refer to the menus you prepare for each of your applications programs as Bar-menu Description Files, giving them the extension .BDF.

Preparing a BDF is not a difficult task, but it does take some planning to produce the best possible menu. It will help to bear in mind that SLASHBAR operates in some ways like a keyboard macro program. That is, when you select the first letter or a command from the menu, SLASHBAR substitutes an alternate key sequence, namely, the commands in your program. SLASHBAR goes further than a simple keyboard macro in that it allows you to impose a whole, multilevel "front-end" interface over your current applications program, but the similarity remains. In preparing your menu levels, you may also want to bear in mind that, by designing similar shells for your other programs, you can have a consistent interface for very dissimilar applications.

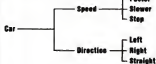
**MENU TREES** For most spreadsheet users, working with a menu tree is a familiar experience. But for many others, used to DOS's single command-line input, a little explanation may be helpful. A menu tree is a convenient way of grouping the command choices that control a program's operation. Consider the example of driving a car. At any given moment, you have a set of choices: you can increase or decrease your speed, stop, turn left or right, or go straight. The diagram "A Menu Tree for Driving a Car" shows how a menu tree is used to represent those choices. A path is followed from left to right, with a choice required at each juncture. (A menu tree may also be drawn hierarchically, from the top to the bottom. The important thing to notice is that the tree generally gets wider as you travel further into it.) In a similar way, a menu tree can be created for an applications program by analyzing how the application currently works, and what the choices are.

By way of example, let's construct a menu to implement some common DOS commands. The first step is to divide the commands into categories by function or application. In our car-driving menu, the commands were divided into those affecting speed and those affecting direction.

For DOS, I'll choose a subset of the available commands and create categories that reflect the type of object on which they act. The table "Commands and Categories for a Sample DOS Shell" lists the DOS commands and categories I've chosen for this example.

The category names will become the choices, or options, on the top menu level, analogous to SPEED and DIRECTION in the car menu. When naming your options, try to ensure that, at the same organizational level, each begins with a different letter. Using two option names that begin with the same letter will prevent the second command from being executed when only

#### A Menu Tree for Driving a Car



#### Commands and Categories for a Sample DOS Shell

COMMAND	CATEGORY
DIR	FILE
COPY	FILE
TIME	SYSTEM
DATE	SYSTEM
ASSIGN	DISK
CHOIR	DISK
CLS	SCREEN
ERASE	FILE
FORMAT	DISK
LABEL	DISK
MDIR	DISK
PROMPT	SYSTEM
RENAME	FILE
RMDIR	DISK
TYPE	FILE
VER	SYSTEM
WOL	DISK

the first letter of the name is pressed.

An option may either cause an immediate action, as in the case of the CLS command, or it may be processed as if it were the top level of a separate menu. Suboptions are then grouped by category under each main option and names are chosen to represent the function of each group. The

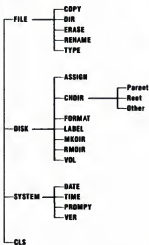


names of the options do not have to be the same as the command itself—I did this only for clarity in the current example. When a command leaves no further choices, that branch of the menu tree is ended. The "DOS Menu Tree" diagram shows what the completed menu tree for the DOS shell example looks like.

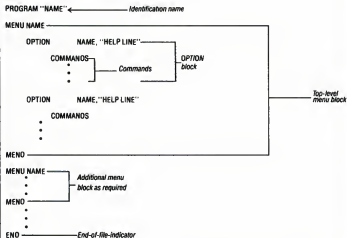
**PLANTING THE TREE** Once the menu tree is designed, transforming it into a Bar-menu Definition File is a simple process. The "BDF Block Structure" diagram illustrates the general block structure and the components that make up each block of the menu, and the illustrative DOS menu (Figure 3) should help you follow the syntax so that the menu will compile under MAKEBAR. While the BDF file may be as large as desired, the BAR file is limited by the size of the output buffer, or about 46,000 bytes. [As a rough indicator, the *DOS.BDF* file is 3,072 bytes long. After being compiled by *MAKEBAR.COM*, the resulting *DOS.BAR* file is 1,403 bytes in length.—Ed.] As you build menus, keep in mind that the purpose of the menu is to enter the keystrokes needed by the application to perform the function you have picked with the menu. When the pop-up

menu is activated, the generated keystrokes are stored in an internal string buffer until it is time to execute them. If the menu command is not completed, the

#### A DOS Menu Tree



#### The BDL Block Structure



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## ■ PC LAB NOTES

```

NOV AL,0000H ;Open file for reading
OVR,CNT,0 ;if first file
JZ FILE_OPEN ;Create file if second
FILE_OPEN:
NOV DI,OFFSET PATH_BUF ;Pathname in DI
LPT 214 ;Store in SI
JNC SOURCE_OPEN ;No carry if open OK
OVR,DI,DI ;DI=OFFSET AND_FILE_BUF
JMP OPEN_BUF ;Change switch
SOURCE_OPEN:
INC OPEN_CNT ;Change switch
SET OPEN_A_FILE
=====
; Close the files to update the length.
=====
CLOSE_FILES PROC NEAR
NOV AL,3EH ;Close file function
DI,INPUT_BUF ;first file
LPT 214 ;Third DOS
NOV AL,3EH ;Close file function
DI,OUTPUT_BUF ;second file
LPT 214 ;Third DOS
RET
=====
CLOSE_FILE ENDP
=====
; TOKENIZE -- Read and process the Raw Definition File (RDF).
=====
TOKENIZE PROC NEAR
=====
; Clear flags and reset source line pointer.
=====
ROR AL,AL ;Zero
MOV PROGRAM_NAME_FLAG,AL ;the program name
MOV XREF_FLAG,AL ;XREF block
MOV SOURCE_LINE,AX ;Source line counter
NOV DI,OFFSET RESP_NAME_TAB ;fill the table with source
NOV CX,RESP_TAB_LEN ;table's length
REP STCMB ;do it
CALL REVERSE_OFFSET ;Load name where letter buf
NOV DI,OFFSET OUTPUT_BUF ;fill output buffer pointer
=====
; Parse the input file to find commands and arguments.
=====
FINL_WORD:
CALL NON_WHITE ;Find non-white char
CMP AL,CN ;Ignore blank lines
JBE YES_1
CALL NEXT_LINE ;skip to next line
JMP FINL_WORD ;Continue search
=====
YES_1:
=====
; If this is a PROGRAM statement, load the name of the program into the
; buffer. Must be the first command in the file.
=====
CALL NAME ;Copy word at SI to buffer
; and make ASCII
ROR DI ;Reverse SI
MOV SI,DI ;look up word in this table
CALL TABLE_LOOKUP ;Return SI
CMP AL,CN ;AL = CN? 0 or FF?
JBE SI_ERROR ;no, valid CN found
NOV DI,OFFSET RESP_CMD_BUF ;no, valid CN found
JMP NEXT_LINE
=====
YES_1a:
=====
; If this is a PROGRAM statement, load the name of the program into the
; buffer. Must be the first command in the file.
=====
CALL PROGRAM_NAME_FLAG ;Test if already had PROGRAM
JBE YES_2 ;else, result
CMP AL,_PROGRAM ;is this PROGRAM?
JBE YES_1 ;yes, jump
JMP YES_2 ;Did we have one?
JBE YES_1a ;yes, try next cmd
JMP YES_2 ;no, success
=====
YES_2:
=====
; Yes, Did we have one?
JBE YES_1a ;no, this is first
JMP YES_2 ;yes, indicate error
=====
YES_2a:
=====
; Copy the name of the program to the output buffer.
=====
NOV SI,DI ;Point SI to start of buf
NOV AL,0000H ;fill name with spaces
MOV CX,10 ;SI char
REP STCMB ;do it
CALL NEXT_WORD ;Copy quoted string
CALL TEST_FLAG ;
INC PROGRAM_NAME_FLAG ;Make flag non-zero
JMP YES_2a
=====

```

[illegible]

(Figure 1 continues)



## ■ PC LAB NOTES

; To start new option block, increase the option counter.  
; Parse name and help line and point the pointers at them.

```

NEW_OPTION_BLOCK:
INC     OPTION_FLAG      ;include option block
MOV     SP,NEW_READ      ;number options this MENU
INC     WORD PTR [BP]    ; increase by 1

```

; Save the option name

```

CALL    NEXT_WORD        ;Point to OPTION NAME
CMP     AL,CL            ;Option name have name
JNE     JUMP_IF_NAME     ;Jump if name

TER_8A:
MOV     DI,OFFSET NO_NAME_ADDR
JMP     TER_8A          ;out of range jump

TER_9:
CALL    MAKE_NAME        ;Make name at SI into ASCII
MOV     AX,SI            ;Address where name is stored
STP     AX,OFFSET MENU_BUF ; is saved in menu header
STWORD

```

; Copy the option name from the buffer to the menu buffer

```

POW8    SI
MOV     SI,OFFSET MENU_BUF ;save register
;source for copy

LOO800  CALL    PUT_MENUBUF ;Get char
OR      AL,AL             ;if not last byte
JNE     COPY_NAME        ;continue copy
POP     SI                ;Restore register
CALL    NEXT_WORD        ;Look for help line

```

; HELP line is quoted string

```

TER_11:
MOV     AX,SI            ;Offset from start of buf
MOV     SI,AX,OFFSET MENU_BUF ; is location to put
STWORD  CALL    TER_8A     ; in header

```

; Put the offset where the tokenized commands will start into the header.

```

MOV     AX,SI            ;Current location
MOV     SI,AX,OFFSET MENU_BUF ; since start is offset
STWORD  JMP     FIND_WORD ;Put word

```

; The menu command requires a cleanup to be performed.  
; The length of the header is calculated and added to the offset in the header. Then the menu\_buf is appended to the output\_buf.

```

TER_12:
CMP     AL,TERD          ;if not TERD, move on
JNE     TER_13AA

```

; Close out the option block (if there was one).

```

MOV     AL,TERD          ;write end token
CALL    PUT_MENUBUF

```

; Finish the buffers.

```

POW8    SI
MOV     SI,NEW_READ      ;save register
;Address of start of menu
;is the output file
;Number of entries in menu

LOO800  MOV     CX,AX      ;#words = # entries * 3
RCL     CX,1              ; * 2
RCL     CX,1              ; * 1 is same as * 2

JCH     APPEND_TOKENS     ;NULL menu below
POW8    CX
MOV     AL,CL            ;save number words to update
INC     AX               ;length of offset
INC     AX               ; plus one
RCL     AX,1             ; time two

MOV     CX,NEW_READ      ;offset of start of menu
MOV     SI,OFFSET OUTPUT_BUF ; from start of buf
ADD     AX,CX            ; plus length of header
POP     CX

UPDATE_POINTERS:
ADD     WORD PTR [SI],AX ; make pointers correct
INC     SI               ;skip to next pointer
LOOP    UPDATE_POINTERS

```

; Append the tokenized menu

```

APPEND_TOKENS:
MOV     CX,SI            ;End of menu buf
MOV     SI,OFFSET MENU_BUF ;start of menu buf
MOV     CX,SI            ;# bytes to transfer
MOV     BP,MOVSI         ;do it
POP     SI               ;reset register

```

; Reset the flags.

```

MOV     OPTION_FLAG,#
MOV     OPTION_FLAG,#
JMP     FIND_WORD        ;get next command

```

; Deal with commands other than PROGRAM, MENU, and OPTION

```

TER_13AA:
CALL    PUT_MENUBUF      ;Put the token in the file
CMP     AL,TERDITE       ;if not accurate
JNE     TER_13           ; move on

```

; EXECUTE command references another menu. Let the SEARCH\_MENU\_TABLE routine satisfy the reference, or leave a "wanted" message.

```

CALL    NEXT_WORD        ;Point to word
JNE     TER_13A          ;End of line?
JMP     TER_8A           ;out of range jump

```

```

TER_13A:
CALL    MAKE_NAME        ;Put name in buffer
MOV     AX,SP            ;is next address
CALL    SEARCH_MENU_TABLE ;Try and resolve
JMP     FIND_WORD

```

; Separate out commands that take arguments.

```

TER_13:
CMP     AL,ARG           ;Ask token string
JNE     TER_17           ;is done type
JNE     TER_17           ;Token already in, so go
JMP     FIND_WORD

```

; These commands require the quoted string following them to be included as an ASCII string following the command byte.

```

TER_17:
CALL    NEXT_WORD        ;Point to string
CALL    TER_8A           ;Copy it
JMP     FIND_WORD

```

TOKENIZE

; AN points to an ASCII string. Look up that string in table pointed to by SI to see if we can find a match.

```

TABLE_LOOKUP:
PROC    NAME
POW8    DI
POW8    CX
POW8    DI

```

X08 CL,CX ;Command counter

```

CL_0:
CMP     BYTE PTR [DI],0 ;End of table?
JNE     CL_3             ;Jump if not
MOV     CL,NEW           ;Initial error

```

```

CL_1:
MOV     AL,CL            ;Address and number
POP     SI               ;Restore registers
POP     CX
POP     DI

```

```

CL_2:
MOV     SI,AX            ;Pointer to unknown command
CALL    PTR_CMP         ;is it matched
JNE     CL_3             ;if not matched
JMP     CL_0

```

```

; Point to next
; Test for table end

```

TABLE\_LOOKUP ENDP

; Compare strings at DI,SI where SI is a table.

```

PTR_CMP:
PROC    NAME
MOV     DI,[DI]          ;Get char from string
INC     DI               ;Point to next
MOV     AL,[SI]          ;Get char from table
INC     SI               ;Point to next
CMP     AL,DL            ;if equal
JNE     PTR_1            ;Jump
DEC     SI               ;skip in table

```

```

PTR_2:
MOV     DI,[SI]          ;Scanline char in table
INC     DI               ;Get next char
CMP     DI,0             ;is it end of entry?
JNE     PTR_2            ;no, continue scanning
JMP     RET              ;return with failure

```

```

PTR_3:
OR      DI,0             ;if both not 0
JNE     PTR_1            ;continue compare
JMP     RET              ;same string match

```

```

PTR_CMP ENDP
; This procedure prints an error message and indicates the source line number in which it occurred.

```

```

ERROR_EXIT:
PROC    NAME
MOV     AX,9             ;Print the error message
INT     3               ;Exit: END

```

(Figure 1 continues)







```

TB_1:      MOV     R1,                ;Save used register
          MOV     SHIFTP_FLAGS,S    ;Clear shift flags
TB_1A:     CALL    GET_CHAR          ;Get next char
          CALL    CR_OR              ;If not CR
          JNZ     TB_2QDTE          ;go to next test
TB_2B:     JNZ     TB_2BDR           ;Segment a syntax error
TB_2QDTE:   CNF     TB_1A            ;If quote
          JNZ     TB_2B             ;and leave
TB_2BDR:   MOV     R0,AL             ;Make string endle
          CALL    PUT_NUMBEROF       ;and write in buffer
          CALL    NEXT_LINE          ;Position to next line
          POP     DI                  ;restore register
          RET                         ;and leave
TB_1A:     CNF     TB_1              ;Key name follows
          JNZ     SHIFTC_CHAR        ;If said it not
          CNF     SHIFTP_FLAGS,S     ;If any shift here on
          JNZ     DO_TRANSLATE       ;do translation
          MOV     R0,AL              ;else ASCII output of AL
;-----
; OUTPUT CODE:
          OR      A,R#               ;If R#-8
          JZ      OC_1               ;Output AL only
          SCBC   A,R#               ;Switch
          CALL    PUT_NUMBEROF       ;write the high byte
          SCBC   A,R#               ;restore R#
OC_1:      CALL    PUT_NUMBEROF       ;Put AL in buffer
          RET                         ;each character
;-----
; These keys may be valid with CTRL and ALT, but not SHIFTP
;-----
DE_SHALT:  CNF     TB_1             ;Is SHIFTP on?
          JNZ     TB_1B             ;Is SHIFTP on?
DEAD_SHALT:MOV     DEAD_SHALT,DEAD_SHALT ;Invalid key combo
          JNZ     TB_1B             ;
TB_1B:     ; see if the key is in the table.
          CALL    MAKE_SC            ;Make upper case
          MOV     A,R#               ;Save original char
          MOV     TB_OFFSET RET_TB_1 ;Store for compare
          MOV     CH,DI              ;Save start of table
          MOV     AL,[DI]            ;Get char from table
          INC     DI                 ;Point to next
          OR      A,AL              ;If 0, AL was illegal char
          JZ      TB_1BDR           ;If 0, try again
          CNF     DEAD_SHALT_ERROR    ;Are we having a match?
          SBC     A,AL              ;No, try again
          SBC     TB_1B              ;Adjust pointers
          JNZ     TB_1BDR           ;Have a match if here
          MOV     AS,CI              ;Offset into table
          MOV     AS,CI              ;
;-----
;-----
          OR      A,25               ;If A-2
          JNZ     IS_ALPHA          ;Increase as alpha key
          CNF     TB_1B              ;Remove alpha bias
          MOV     SHIFTP_FLAGS,CTRL ;Go perforce CTRL combo
          MOV     TB_1              ;
          OR      AL,11              ;These are ALT combos
          AND     A,DEAD_SHALT_ERROR ;Too high
          CNF     AL,OFFTBZ          ;Output 2 bytes
          JNZ     OUTPUT_CODE        ;
TB_2:      INC     AL,1              ;CTRL combo
          MOV     TB_OFFSET RET_TB_2 ;multiply by 2
          OR      A,DIAX             ;find word in table
          MOV     AL,[DI]            ;find next char
          OR      A,AZ              ;if zero
          JNZ     TB_1BDR           ;this combo not allowed
          JZ      DEAD_SHALT_ERROR  ;else write it
          JNZ     OUTPUT_CODE        ;
;-----
; CTRL/ALT alphabet combinations.
;-----
IS_ALPHA:  CNF     SHIFTP_FLAGS,ALT ;
          JZ      TB_1              ;
          SBC     A,AL              ;ALT is simple, add 1
          JNZ     OUTPUT_CODE        ;
TB_3:      JNZ     OUTPUT_CODE
          MOV     TB_OFFSET RET_TB_3 ;
          OR      A,DIAX             ;CTRL keys combos
          MOV     AL,[DI]            ;Add offset to
          OR      A,AZ              ;get char code
          JNZ     ASCII_LOOKUP       ;ASCII lookup
          JNZ     OUTPUT_CODE        ;find it to buffer
          ;-----

```

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```

; Here the (strings) are translated to their equivalent keystrokes.
; Here the key name lets the ASCII buffer.
=====
$PC_0AH: MOV DI,OFFSET PATH_BUF

SC_1: CALL GET_CHAR ;Get char inside brace
      CALL AL,' ' ;If decoded, use [
      JNE SC_2 ;Jump for other brace
      MOV DI,OFFSET PATH_BUF ;if = no chars have been
      JCZ OC_1 ;processed yet. [[

SC_8A: MOV DX,OFFSET START_MSG ;
      JMP ERROR_EXIT

SC_2: MOV AL,COPYE ;if char is quote
      JB SC_8B
      CJB AL,'"' ;Close brace?
      JE SC_3 ; go search table
      CALL MAKE_UC ;Make Upper case
      STOSB ;Put char in buffer
      JNB SC_1 ;Continue to copy key name

SC_3: JMP AL,AL ;make ascii

; =====
; Test for the Function keys (46 combinations)
; Returns 0 if entry in table or PFB if not found.
=====
      MOV AX,$FFFF
      OR AL,AX ; $ = True SHIFT on
      JPE SC_4
      MOV SHIFT_FLAGS,_SHIFT
      JBP TR_1AA

SC_4: DEC AL ; $ = True CTRL on
      JPE SC_5
      MOV SHIFT_FLAGS,_CTRL
      JBP TR_1AA

SC_5: DEC AL ; $ = True ALT on
      JPE SC_6
      MOV SHIFT_FLAGS,_ALT
      JBP TR_1AA

; =====
; Test for the Function keys (46 combinations)
; =====
SC_6: DBF AL ;Adjust key number
      CNP AL,9 ;Range 0-9
      JA SC_1B ;Can't be function key
      ADD AL,$80 ;Key code
      MOV AH,SHIFL_FLAG ;True for shift states
      CJP AH,_SHIFT ;For shift
      JNE SC_7
      ADD AL,$100 ;add lsh

SC_7: CJP AH,_CTRL ;For CTRL
      JBE SC_8
      ADD AL,$200 ;add ctrl

SC_8: CJP AH,_ALT ;For ALT
      JBE SC_9
      ADD AL,$300 ;add shft

SC_9: MOV AH,$FFF ;Add this extended ascii
      MOV DX,OUTPUT_CODE ;Output the byte

; =====
; ALT is not allowed for these keys.
; =====
SC_10: CNP SHIFL_FLAGS,_ALT ;If Alt's not on
      JBE SC_10B ; Jump
      JMP DEAD_KEY_ERROR ; else, error

SC_10A: MOV AL,0
      JBE SC_11
      MOV AL,$100 ;Eliminate F100
      JBE SC_11
      MOV AL,$100 ;SEC key
      JBE SC_11
      DEC AL ;TAB key
      JBE SC_11
      CJP SHIFL_FLAGS,$ ;any shift keys on?
      JNE SC_12 ;No, jump
      CJP SHIFL_FLAGS,_SHIFT ;Shift only is allowed
      JBE SC_10A ;else error
      MOV AH,$FFFF ;SHIFL-TAB
      JBP OUTPUT_CODE ;to output

SC_12: MOV AL,9 ;Normal TAB

SC_12A: JMP OC_1

; =====
; These keys are the same alone or with SHIFT, but CTRL is different.
; =====
SC_13: DEC AL ;Remove bias
      SUB AL,$80 ;Add Ad

```

(Figure 1 continues)



## ■ PC LAB NOTES

```

GET_CHAR      PROC    MAIN
;-----
; Check buffer for pointer past end.
;-----
MOV     AX,01          ;save register
INC     SI              ;address pointer
MOV     AX,01          ;current location
MOV     AX,OFFSET INPUT_BUF ; skip start
CMP     AX,INPUT_BUF_SIZE ; longer than allowed
JNB     AX              ; (exceeds pointer)
CALL    ADDRESS_BUFFER ; attempt to load buffer

; AX contains the number of chars read. If AX=0, unexpected EOF.
;-----
OR      AX,AX          ;if chars read
JNE     CX,1           ;loop if not 0
MOV     CX,OFFSET BUF_ADDR
JMP     EXIT

; check far, and eliminate comments
;-----
GC_1:      MOV     AL,[BX] ;Get new char
           OR      AL,CR  ;if new line
           JNB     GC_2  ;reset comment
           MOV     WORD PTR [BX],0
           INC     BX
           JNB     GC_2  ;next line

GC_2:      MOV     COMMENT_FLAG,0 ;if inside comment
           JNB     GET_CHAR      ;read until CR
           RET

GC_3:      MOV     AL,';'      ;if this isn't a comment
           JNB     GC_2        ;then continue
           INC     COMMENT_FLAG ;else read until CR
           GET_CHAR

```

```

GET_CHAR      EOP
;-----
PUT_MESSAGE   PROC    MAIN
;-----
MOV     [BX],AL ;Write byte to [bx]
INC     BX      ;move pointer
RET

PUT_MESSAGE   EOP
;-----
; Buffer Allocation area
;-----
PC        = 0
LAST_BYTE = PC
WRITE_BUF = PC + 8 ; 44 DWP (7)
PC        = PC + 64
INPUT_BUF = PC
PC        = PC + INPUT_BUF_LEN ; 40 INPUT_BUF_LEN DWP(7)
OUTPUT_BUF = PC
PC        = PC + OUTPUT_BUF_LEN ; 40 OUTPUT_BUF_LEN DWP(7)
HEXD_BUF = PC
PC        = PC + HEXD_BUF_LEN ; 40 HEXD_BUF_LEN DWP(7)
HEXD_ASCII_TBL = PC
PC        = PC + HEXD_ASCII_TBL_LEN ; 40 HEXD_ASCII_TBL_LEN DWP(7)
;-----
CWD      EBP
END      EOP

```

(Figure 1 ends)

buffer is emptied and no keys will be passed to the application.

To help others understand your work (and to remind yourself weeks or more later!), you can include comments in the source (.BDF) file. The comment character, which must begin each comment, is the semicolon (;). Comments may occupy a separate line or follow a command. During compilation, when MAKEBAR encounters a semicolon, it ignores the re-

mainder of the line. Because MAKEBAR uses a simple algorithm to read and translate the source file, a semicolon must be represented in names or quoted strings by the {c} key combination. Two types of text entries are used in menu files. A *string* is an entry surrounded by quotes (""). "DOS 3.1" and "JiffyCalc Spreadsheet" are examples of valid strings. A string may not contain the quote character, but the {C} combination may be used instead. A *name* is an entry consisting of a single word and must contain no spaces. To aid readability, separation characters may be used in names: DO\_THIS, DO\_THAT, and DOSITSNOW are all valid. Upper- and lowercase are preserved in strings, but names are capitalized in the output file.

Strings may contain any character or key combination (except the comment and quote characters themselves) that can be recognized by the BIOS. Key combinations in a BDF file that are not recognized by the BIOS will produce an error message. This means that it may not be possible for you to include *all* commands for a given application into the menu structure. Redundant key combinations, such as {S}a instead of A, will also produce an error message.

Alphanumeric keys are entered by typing them. All special keys such as the function keys and Shift-key combinations are entered in symbolic form as text surrounded by braces. The Shift, Ctrl, and Alt keys affect only the immediately following key. See the table "Special Key Names for Use with MAKEBAR" for a listing of the available special keys. For example, to block out a paragraph in *WordPerfect*, the

sequence would be

"{A}[F4][ENTER]"

To enter the *WordStar* Ctrl-KD sequence (to end editing and save changes), you would use the string

"{C}[KD]"

and to replace the current file in *1-2-3*, you would use

"{/FSR"

## ■ Key combinations in a BDF file that are not recognized by the BIOS will produce an error message, as will redundant key combinations.

mainder of the line. Because MAKEBAR uses a simple algorithm to read and translate the source file, a semicolon must be represented in names or quoted strings by the {c} key combination.

Two types of text entries are used in

### Special Key Names for Use with MAKEBAR

{ESC}	Escape
{TAB}	Tab
{ENTER}	Enter
{BS}	Backspace
{HOME}	Home
{PGUP}	Page Up
{PGDN}	Page Down
{END}	End
{U}	Up Arrow
{D}	Down Arrow
{L}	Left Arrow
{R}	Right Arrow
{INS}	Insert
{DEL}	Delete
{C}	Control
{S}	Shift
{A}	Alt

#### Function Keys

{F1}	{F2}	{F3}	{F4}	{F5}
{F6}	{F7}	{F8}	{F9}	{F10}



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## ■ PC LAB NOTES

```

100 REM -- BASIC PROGRAM TO CREATE MAKEBAR.COM
110 OPEN "MAKEBAR.COM" AS #1 LEN = 1
120 #1 PRINT #1, "OK"
130 CHECKSUM = 0
140 FOR I = 1 TO 200
150   LINE$ = " "
160   FOR J = 1 TO 5
170     READ BDF
180     CHECKSUM = CHECKSUM + BDF
190     LINE$ = LINE$ + BDF
200   IF (BDF < 230) THEN LAST A$ = CHR$(BDF)
210   NEXT J
220   NEXT I
230   READ L$
240   IF L$ = "END" THEN PRINT "Error in Line", 200 + I : GOTO 1
250   NEXT I
260   CLOSE
270 IF CHECKSUM = 206440 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA 233, 89, 3, 77, 63, 75, 89, 89, 877
300 DATA 85, 82, 32, 40, 49, 48, 23, 49, 384
310 DATA 89, 42, 32, 40, 57, 56, 55, 44, 433
320 DATA 32, 89, 185, 182, 182, 65, 68, 87, 843
330 DATA 118, 185, 115, 32, 89, 117, 89, 188, 773
340 DATA 185, 115, 184, 185, 118, 183, 32, 67, 741
350 DATA 111, 114, 114, 114, 114, 114, 114, 114, 114
360 DATA 111, 89, 182, 114, 114, 114, 114, 114, 114
370 DATA 32, 77, 117, 188, 188, 182, 188, 8, 648
380 DATA 8, 8, 8, 255, 255, 8, 8, 510
390 DATA 8, 8, 8, 255, 8, 65, 83, 483
400 DATA 75, 87, 82, 8, 64, 89, 89, 458
410 DATA 87, 85, 84, 89, 8, 73, 78, 89, 536
420 DATA 85, 84, 8, 77, 68, 78, 89, 478
430 DATA 88, 84, 73, 78, 78, 89, 523
440 DATA 82, 78, 71, 82, 65, 77, 8, 84, 508
450 DATA 88, 68, 8, 77, 68, 78, 89, 518
460 DATA 8, 8, 78, 89, 8, 8, 8, 588
470 DATA 8, 8, 65, 8, 78, 48, 8, 78, 221
480 DATA 8, 8, 51, 8, 78, 52, 8, 683
490 DATA 78, 52, 8, 78, 54, 8, 78, 55, 373
500 DATA 8, 78, 56, 8, 78, 57, 8, 78, 523
510 DATA 48, 8, 68, 8, 68, 8, 84, 488
520 DATA 65, 89, 8, 68, 78, 84, 68, 82, 513
530 DATA 8, 89, 83, 8, 72, 78, 77, 89, 448
540 DATA 8, 8, 71, 89, 8, 8, 8, 483
550 DATA 68, 8, 89, 71, 89, 78, 8, 73, 439
560 DATA 78, 82, 8, 89, 68, 76, 8, 89, 458
570 DATA 8, 68, 8, 89, 82, 8, 8, 426
580 DATA 85, 89, 87, 68, 68, 78, 71, 72, 548
590 DATA 78, 74, 75, 76, 77, 78, 78, 89, 613
600 DATA 81, 82, 84, 89, 8, 8, 8, 578
610 DATA 89, 89, 48, 58, 51, 52, 54, 489
620 DATA 55, 58, 57, 48, 45, 45, 8, 483
630 DATA 8, 58, 58, 58, 294, 8, 483
640 DATA 8, 8, 8, 8, 38, 8, 8, 38
650 DATA 8, 8, 8, 8, 28, 8, 38, 8
660 DATA 8, 8, 28, 8, 27, 8, 38, 8
670 DATA 38, 48, 48, 32, 18, 33, 34, 35, 278
680 DATA 25, 38, 37, 38, 48, 34, 25, 182
690 DATA 18, 18, 31, 28, 32, 47, 17, 40, 317
700 DATA 25, 44, 32, 254, 8, 127, 71, 118, 857
710 DATA 78, 32, 78, 117, 8, 118, 82, 642
720 DATA 83, 8, 72, 8, 89, 8, 75, 115, 425
730 DATA 78, 118, 8, 8, 89, 85, 115, 87, 488
740 DATA 182, 181, 8, 38, 77, 85, 75, 89, 588
750 DATA 89, 89, 82, 22, 81, 112, 87, 118, 861
760 DATA 184, 118, 118, 112, 117, 116, 89, 852
770 DATA 182, 189, 189, 181, 23, 81, 112, 87, 748
780 DATA 116, 184, 83, 111, 117, 116, 112, 117, 888
790 DATA 116, 85, 182, 189, 188, 181, 38, 67, 758

```

```

800 DATA 87, 118, 28, 116, 32, 78, 112, 181, 686
810 DATA 118, 32, 78, 189, 189, 181, 28, 69, 631
820 DATA 118, 114, 114, 114, 114, 114, 114, 114, 114
830 DATA 189, 185, 118, 182, 32, 78, 189, 188, 733
840 DATA 181, 36, 68, 117, 112, 188, 185, 89, 748
850 DATA 87, 116, 181, 32, 67, 188, 188, 89, 748
860 DATA 67, 188, 188, 32, 78, 117, 116, 32, 652
870 DATA 78, 182, 32, 78, 114, 188, 181, 114, 721
880 DATA 36, 80, 118, 87, 118, 118, 118, 118, 718
890 DATA 32, 67, 188, 188, 36, 77, 68, 78, 568
900 DATA 65, 32, 87, 185, 116, 184, 111, 117, 757
910 DATA 118, 32, 87, 188, 78, 68, 36, 82, 558
920 DATA 121, 118, 116, 87, 128, 32, 68, 114, 778
930 DATA 114, 111, 114, 36, 77, 188, 115, 125, 877
940 DATA 185, 118, 182, 32, 78, 87, 188, 181, 735
950 DATA 36, 89, 87, 188, 32, 77, 89, 78, 555
960 DATA 89, 32, 82, 181, 182, 181, 114, 181, 718
970 DATA 189, 89, 181, 36, 77, 185, 115, 115, 758
980 DATA 185, 118, 183, 32, 89, 78, 89, 36, 881
990 DATA 89, 181, 87, 189, 43, 75, 181, 121, 788
1000 DATA 32, 111, 114, 32, 89, 87, 188, 32, 584
1010 DATA 75, 181, 121, 36, 12, 188, 89, 114, 538
1020 DATA 114, 114, 23, 65, 114, 38, 76, 688
1030 DATA 189, 181, 181, 32, 35, 32, 32, 32, 478
1040 DATA 32, 32, 32, 32, 36, 188, 8, 188, 538
1050 DATA 1, 289, 32, 352, 292, 11, 8, 737
1060 DATA 232, 11, 8, 232, 81, 8, 184, 8, 858
1070 DATA 78, 285, 33, 188, 62, 8, 332, 17, 882
1080 DATA 8, 183, 71, 8, 232, 11, 8, 183, 841
1090 DATA 1, 188, 8, 75, 1, 8, 8, 358
1100 DATA 8, 232, 112, 38, 89, 13, 188, 358
1110 DATA 8, 189, 181, 2, 283, 28, 8, 84, 444
1120 DATA 332, 78, 2, 138, 289, 84, 43, 289, 1888
1130 DATA 118, 116, 118, 118, 118, 118, 118, 118, 118
1140 DATA 164, 58, 182, 178, 184, 8, 81, 128, 848
1150 DATA 32, 137, 3, 8, 116, 2, 254, 284, 778
1160 DATA 189, 32, 8, 8, 38, 115, 3, 284, 778
1170 DATA 151, 2, 235, 289, 254, 6, 137, 3, 888
1180 DATA 189, 32, 38, 188, 188, 32, 38, 188, 778
1190 DATA 33, 188, 62, 188, 77, 1, 285, 727
1200 DATA 32, 23, 182, 182, 188, 2, 182, 887
1210 DATA 183, 183, 183, 183, 183, 183, 183, 183, 183
1220 DATA 189, 189, 243, 178, 232, 137, 8, 1344
1230 DATA 181, 255, 24, 232, 8, 3, 69, 13, 785
1240 DATA 2, 23, 25, 2, 23, 24, 23, 23, 23, 23
1250 DATA 4, 89, 188, 8, 1, 232, 115, 893
1260 DATA 1, 84, 68, 255, 117, 5, 186, 217, 895
1270 DATA 25, 75, 188, 62, 188, 8, 8, 884
1280 DATA 8, 116, 8, 157, 117, 23, 558
1290 DATA 8, 157, 118, 5, 188, 188, 1831
1300 DATA 53, 188, 122, 178, 31, 188, 1843
1310 DATA 8, 243, 178, 232, 148, 1, 232, 183
1320 DATA 2, 254, 8, 188, 2, 235, 178, 887
1330 DATA 117, 43, 188, 89, 2, 2, 581
1340 DATA 6, 89, 2, 116, 5, 186, 228, 2, 645
1350 DATA 12, 188, 3, 116, 188, 188, 188, 188, 188
1360 DATA 3, 116, 6, 186, 17, 2, 233, 82, 884
1370 DATA 186, 255, 24, 138, 287, 43, 282, 1897
1380 DATA 138, 77, 1, 13, 182, 171, 284, 8, 818
1390 DATA 4, 117, 48, 128, 82, 89, 89, 718
1400 DATA 8, 117, 288, 187, 175, 284, 117, 1801
1410 DATA 2, 138, 82, 188, 188, 188, 188, 188, 188
1420 DATA 2, 232, 89, 3, 68, 12, 116, 682
1430 DATA 68, 232, 18, 161, 78, 1, 43, 834
1440 DATA 235, 24, 232, 188, 2, 232, 148, 1, 1858
1450 DATA 233, 89, 235, 128, 62, 89, 2, 8, 858
1460 DATA 13, 138, 82, 188, 188, 188, 188, 188, 188
1470 DATA 68, 5, 116, 8, 157, 117, 78, 186, 728

```

(continues)

Figure 2: A BASIC program that will create MAKEBAR.COM.

**BUILDING THE BDF** A BDF file always begins with the word PROGRAM, followed by a string. Since different menu files may be loaded into SLASHBAR at different times, the first ten characters of the string are encoded in the compiled .BAR file for display in the pop-up window. PROGRAM must be the first non-comment line in the BDF file, and it must appear only once. Conversely, END causes processing of the input file to cease and is the last command read. Each BDF must include an END.

The remainder of the file consists of MENU-MEND blocks. Each block corre-

sponds to one complete set of command choices. In the DOS example in Figure 3, there are five menu blocks: the top-level block (which I'll call MAIN); three second-level blocks (the FILE, DISK, and SYSTEM submenus); and one third-level block (the CHDIR sub-menu). Note that the CLS option does not require a menu block since that command terminates at the first level. The MENU block that follows the PROGRAM command is assumed to be the top-level menu and will be the first executed. Subsequent MENU blocks may appear in any order.

Each MENU statement takes a *name* as

its argument, and no two menus can have the same name. The name is used as a target when control is transferred between menus with the EXECUTE command. Attempting to use two identical menu names will cause MAKEBAR to report a Bad Menu Reference.

The MENU block is divided into one or more OPTION blocks. An OPTION block comprises three separate parts: name, help line, and commands. While, like a menu, each option must have a name, there are no restrictions as to uniqueness. The same option name may be used in different menus with different meanings without causing a



1400 DATA	200,	2,	235,	162,	157,	116,	0,	176,	1053	2190 DATA	115,	249,	131,	100,	4,	239,	33,	139,	1290
1410 DATA	18,	232,	07,	4,	254,	6,	09,	2,	694	2200 DATA	115,	249,	131,	100,	4,	239,	33,	139,	1290
1420 DATA	139,	40,	79,	1,	295,	70,	0,	232,	822	2210 DATA	1,	0,	252,	250,	1,	60,	13,	117,	630
1430 DATA	11,	0,	60,	11,	117,	5,	106,	0,	397	2220 DATA	3,	253,	157,	0,	60,	34,	117,	118,	614
1440 DATA	64,	229,	232,	232,	232,	232,	190,	190,	1153	2230 DATA	115,	249,	131,	100,	4,	239,	33,	139,	1290
1450 DATA	0,	179,	294,	171,	86,	190,	31,	911,	2240 DATA	95,	199,	60,	123,	116,	123,	130,	62,	802	
1460 DATA	172,	252,	0,	0,	18,	182,	117,	240,	1822	2250 DATA	01,	0,	0,	117,	118,	120,	18,	989	
1470 DATA	84,	232,	232,	232,	232,	232,	0,	179,	1113	2260 DATA	115,	249,	131,	100,	4,	239,	33,	139,	1290
1480 DATA	204,	171,	232,	259,	1,	136,	195,	65,	1237	2270 DATA	134,	224,	232,	232,	1,	239,	190,	120,	1332
1490 DATA	179,	204,	171,	335,	207,	254,	60,	0,	1342	2280 DATA	62,	81,	1,	117,	6,	106,	40,	1372	
1500 DATA	117,	05,	176,	18,	212,	12,	0,	06,	782	2290 DATA	3,	253,	111,	204,	232,	220,	130,	1051	
1510 DATA	139,	54,	79,	1,	173,	139,	208,	289,	994	2300 DATA	624,	191,	232,	1,	139,	207,	130,	5,	1137
1520 DATA	239,	5,	300,	339,	23,	01,	139,	193,	1891	2310 DATA	71,	10,	192,	116,	231,	239,	116,	117,	993
1530 DATA	64,	289,	234,	139,	14,	79,	139,	193,	1891	2320 DATA	245,	79,	139,	109,	42,	239,	109,	20,	963
1540 DATA	233,	225,	24,	3,	183,	09,	0,	092	2330 DATA	118,	33,	44,	26,	126,	12,	81,	1,	493	
1550 DATA	29,	78,	236,	259,	129,	283,	190,	172,	1313	2340 DATA	2,	116,	0,	69,	11,	119,	207,	520	
1560 DATA	204,	43,	284,	243,	164,	194,	0,	1158	2350 DATA	130,	304,	239,	179,	204,	232,	110,	1409		
1570 DATA	90,	0,	0,	0,	0,	0,	0,	003	2360 DATA	2,	3,	240,	139,	5,	12,	182,	116,	716	
1580 DATA	233,	168,	234,	232,	202,	3,	60,	0,	1137	2370 DATA	180,	239,	164,	120,	62,	01,	1,	044	
1590 DATA	117,	22,	252,	136,	0,	60,	13,	117,	697	2380 DATA	116,	0,	254,	192,	232,	153,	191,	40,	1183
1600 DATA	0,	203,	122,	259,	312,	04,	2,	164,	1120	2390 DATA	2,	3,	240,	139,	2,	100,	234,	235,	1865
1610 DATA	209,	295,	232,	232,	0,	233,	139,	240,	1800	2400 DATA	142,	191,	32,	17,	202,	64,	0,	719	
1620 DATA	60,	0,	116,	7,	60,	7,	116,	3,	349	2410 DATA	125,	117,	12,	129,	259,	31,	0,	116,	792
1630 DATA	233,	129,	254,	232,	183,	0,	232,	126,	1380	2420 DATA	137,	186,	247,	2,	253,	4,	254,	48,	1125
1640 DATA	139,	233,	119,	204,	07,	61,	62,	68,	987	2430 DATA	14,	116,	240,	68,	120,	116,	6,	252,	93
1650 DATA	201,	120,	60,	0,	117,	0,	177,	335,	046	2440 DATA	111,	254,	170,	232,	235,	50,	192,	170,	1405
1660 DATA	119,	103,	06,	0,	0,	0,	109,	109,	1400	2450 DATA	66,	190,	142,	1,	104,	31,	0,	232,	707
1670 DATA	232,	6,	0,	135,	240,	254,	193,	235,	1270	2460 DATA	170,	233,	64,	60,	395,	116,	210,	1164	
1680 DATA	232,	130,	23,	71,	134,	32,	78,	50,	700	2470 DATA	162,	117,	0,	0,	100,	0,	81,	1,	604
1690 DATA	242,	116,	10,	70,	126,	23,	70,	116,	716	2480 DATA	233,	39,	232,	24,	200,	117,	0,	100,	1394
1700 DATA	240,	137,	240,	137,	240,	137,	240,	137,	240	2490 DATA	162,	117,	0,	0,	100,	0,	81,	1,	604
1710 DATA	232,	240,	199,	180,	0,	240,	33,	191,	1203	2500 DATA	200,	117,	0,	0,	100,	0,	81,	1,	604
1720 DATA	92,	3,	161,	02,	0,	107,	10,	0,	919	2510 DATA	233,	39,	232,	24,	200,	117,	0,	100,	1394
1730 DATA	92,	3,	161,	02,	0,	107,	10,	0,	919	2520 DATA	233,	39,	232,	24,	200,	117,	0,	100,	1394
1740 DATA	29,	79,	11,	192,	117,	242,	240,	60,	916	2530 DATA	212,	2,	117,	2,	40,	25,	120,	252,	701
1750 DATA	0,	100,	0,	203,	232,	232,	232,	232,	232	2540 DATA	212,	2,	117,	2,	40,	25,	120,	252,	701
1760 DATA	194,	259,	207,	207,	312,	312,	183,	183,	183	2550 DATA	235,	108,	62,	01,	1,	4,	117,	3,	691
1770 DATA	119,	3,	202,	4,	0,	202,	20,	0,	006	2560 DATA	235,	108,	62,	01,	1,	4,	117,	3,	691
1780 DATA	199,	136,	0,	60,	13,	116,	12,	232,	770	2570 DATA	235,	108,	62,	01,	1,	4,	117,	3,	691
1790 DATA	199,	136,	0,	60,	13,	116,	12,	232,	770	2580 DATA	235,	108,	62,	01,	1,	4,	117,	3,	691
1800 DATA	0,	114,	244,	195,	130,	4,	60,	11,	760	2590 DATA	120,	62,	01,	1,	4,	117,	3,	691	
1810 DATA	116,	12,	252,	180,	0,	0,	116,	760	2600 DATA	120,	62,	01,	1,	4,	117,	3,	691		
1820 DATA	232,	6,	0,	135,	240,	254,	193,	235,	1270	2610 DATA	120,	62,	01,	1,	4,	117,	3,	691	
1830 DATA	64,	50,	10,	0,	00,	01,	07,	130,	507	2620 DATA	254,	254,	254,	254,	254,	254,	254,	254,	254
1840 DATA	4,	195,	2,	0,	191,	10,	0,	240,	640	2630 DATA	254,	254,	254,	254,	254,	254,	254,	254,	254
1850 DATA	170,	140,	116,	117,	140,	95,	00,	100	1000	2640 DATA	254,	254,	254,	254,	254,	254,	254,	254,	254
1860 DATA	199,	60,	97,	114,	6,	66,	122,	119,	773	2650 DATA	180,	210,	116,	100,	174,	194,	126,	230,	1230
1870 DATA	232,	232,	232,	232,	232,	232,	232,	232,	232	2660 DATA	117,	212,	100,	204,	253,	176,	204,	03,	1009
1880 DATA	116,	5,	232,	162,	2,	232,	247,	232,	1331	2670 DATA	117,	212,	100,	204,	253,	176,	204,	03,	1009
1890 DATA	197,	2,	195,	00,	07,	02,	61,	731	2680 DATA	81,	82,	100,	66,	100,	192,	139,	20,	820	
1900 DATA	209,	232,	116,	232,	116,	232,	116,	232,	116	2690 DATA	81,	82,	100,	66,	100,	192,	139,	20,	820
1910 DATA	27,	254,	0,	64,	1,	105,	255,	235,	1067	2700 DATA	202,	53,	124,	20,	100,	62,	129,	26,	794
1920 DATA	191,	31,	0,	130,	21,	71,	136,	20,	427	2710 DATA	71,	1,	105,	160,	12,	100,	05,	0,	726
1930 DATA	70,	16,	216,	117,	240,	137,	4,	137,	831	2720 DATA	130,	254,	111,	62,	73,	1,	0,	117,	737
1940 DATA	29,	2,	259,	187,	204,	6,	80,	1,	744	2730 DATA	5,	100,	0,	12,	73,	60,	265,	33,	616
1950 DATA	119,	84,	2,	131,	208,	209,	114,	2,	992	2740 DATA	115,	0,	106,	167,	2,	139,	3,	253,	965
1960 DATA	139,	204,	232,	232,	232,	232,	232,	232,	232	2750 DATA	115,	0,	106,	167,	2,	139,	3,	253,	965
1970 DATA	232,	40,	232,	139,	60,	120,	199,	205,	1310	2760 DATA	142,	79,	1,	90,	40,	93,	105,	07,	781
1980 DATA	24,	139,	13,	209,	209,	3,	249,	40,	927	2770 DATA	131,	11,	0,	97,	252,	77,	253,	115,	005
1990 DATA	209,	70,	240,	240,	240,	240,	240,	240,	240	2780 DATA	131,	11,	0,	97,	252,	77,	253,	115,	005
2000 DATA	5,	190,	60,	2,	234,	235,	52,	1073	2790 DATA	87,	233,	170,	202,	9,	0,	235,	234,	122,	123
2010 DATA	232,	27,	0,	114,	29,	254,	14,	84,	704	2800 DATA	50,	192,	170,	60,	95,	190,	0,	60,	874
2020 DATA	232,	139,	84,	3,	131,	209,	105,	134,	134	2810 DATA	97,	170,	60,	95,	190,	0,	60,	874	
2030 DATA	244,	139,	4,	232,	181,	3,	136,	106,	1016	2820 DATA	73,	1,	00,	114,	13,	123,	125,	255,	613
2040 DATA	232,	96,	2,	199,	60,	2,	234,	235,	1100	2830 DATA	11,	102,	17,	0,	106,	36,	233,	70,	774
2050 DATA	232,	232,	232,	232,	232,	232,	232,	232,	232	2840 DATA	105,	232,	116,	4,	60,	13,	117,	170,	700
2060 DATA	1,	0,	250,	24,	139,	203,	120,	232,	1020	2850 DATA	196,	6,	232,	0,	0,	239,	6,	02,	777
2070 DATA	175,	204,	131,	195,	2,	235,	120,	99,	1148	2860 DATA	1,	130,	62,	222,	0,	0,	117,	207,	740
2080 DATA	92,	05,	102,	104,	0,	117,	0,	249,	90	2870 DATA	196,	62,	137,	212,	232,	0,	239,	6,	02
2090 DATA	230,	120,	60,	0,	117,	0,	249,	90	940	2880 DATA	0,	232,	196,	176,	7,	67,	105,	6,	644
2100 DATA	95,	190,	101,	31,	0,	232,	169,	234,	1376										

(Figure 2 ends)

problem for the compiler. (This would not, however, be the best design for a consistent interface.) Because options may be selected by pressing their first letter, if two options begin with the same letter, the second option can never be executed by pressing that letter. (It can be invoked by positioning the cursor and pressing Enter.) This property could be used to prevent accidental use of a command by making it more difficult to invoke.

The help string must follow each option name on the same line. This string will be displayed below the option names when that option is selected with the cursor. The length of this string must be less than 78 characters in order to fit within the window

created by SLASHBAR. Beginning on the next line, the application program commands to be executed when that option is chosen are entered. Each command must begin on a separate line, and the entire command must be contained on that line. If more keys need to be entered than can fit on a single line, multiple TYPE statements can be used.

**THE BDF COMMANDS** The available BDF commands, together with their syntax, are listed in the accompanying figure "BDF Commands and Their Syntax." The five that remain to be discussed, EXECUTE, ASK, TYPE, INPUT, and CR,

may appear only inside an OPTION block. These commands make up a kind of batch language that controls the operation of the SLASHBAR utility. At the end of each menu path is a command string that will accomplish the desired result when fed to the applications program, just as if you typed in the commands directly.

The EXECUTE command transfers control down the menu tree. Any option may invoke another menu by executing it. Since menu flow is one-way, lines appearing below an EXECUTE command within the same option block will never be invoked. In addition, since paths in the menu tree may not cross, two option blocks cannot execute the same menu. MAKEBAR



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checks for this and signals it as an error. This prevents building a circular reference into the tree, where a menu could call itself indefinitely.

The ASK command is used to prompt the user for information. The string argument appears on the screen in the upper half of the pop-up window and does not affect the output keystrokes. Because the logical use of the ASK command is to request a reply, it is usually followed by the INPUT command. By using these commands together, it is possible to solicit information to complete a command sequence.

The INPUT command accepts input from the keyboard and appends it to the current command string. The input is buffered, and the backspace key can be used to correct the entry. Up to 78 characters may be entered, and input terminates when the Enter key is pressed. The keys are put in the command string as they were typed, without the terminating <Enter>.

The TYPE command copies the keys in the string argument to the command string. Special keys (i.e., function keys and shift-key combinations) are stored with a special code to indicate that they are extended ASCII. A special case of the TYPE command is the CR command. It is equivalent to the command

TYPE "[ENTER]"

### BDF COMMANDS AND THEIR SYNTAX

```
PROGRAM "string"
END
MENU      name
MENU      name, "string"
OPTION    name, "string"
EXECUTE
ASK       "string"
INPUT
TYPE      "string"
CR
```

In the above listing, name is a single word with no separating spaces, and "string" is a series of characters surrounded by quotes (""). The quotes symbol cannot be represented within a string, use \C instead.

## DOWNLOADABLE LAB NOTES

A number of the programs included in this issue's PC Lab Notes are available for downloading by modem, without charge, from the PC Magazine Interactive Reader Service. Details on the procedure and copyright information are presented in a sidebar that runs in each issue of our Programming/Utilities col-

umn. The downloadable programs available for "Designing Menus à la 1-2-3" are:

MAKEBAR.COM  
MAKEBAR.ASM  
MAKEBAR.BAS  
DOS.BDF  
DOS.BAR

### MAKEBAR AT A GLANCE

MAKEBAR.COM is a tokenizing compiler designed for menu files that will be used with SLASHBAR.COM (presented in the Programming/Utilities column of this issue) to provide a Lotus-style interface for non-Lotus applications programs. The syntax for

MAKEBAR is

MAKEBAR [path]input\_file [path]output\_file

where the input\_file is a user-designed .BDF file containing the applications program commands in a format prescribed in the text of this article. The output\_file is a .BAR menu file to be used by SLASHBAR.

and is included for convenience in closing commands after requesting an input.

The complete BDF file to implement the sample DOS menu is shown in Figure 3. Each of the commands is used to demonstrate its syntax. You can compile the file with MAKEBAR and produce a working DOS interface to load with SLASHBAR. By adapting this demonstration menu, you should be able to produce a menu for almost any application.

**THE MAKEBAR PROGRAM** Simply put, the purpose of the MAKEBAR program is to translate Bar-menu Definition Files (.BDF) into .BAR files for the SLASHBAR program. MAKEBAR acts as an interface between the human menu writer and the SLASHBAR program, simplifying the tasks of both. MAKEBAR belongs to a family of programs that includes compilers, assemblers, and interpreters, and is itself a tokenizing compiler. But before I explain exactly what that means, let's examine some basic definitions.

**INTERPRETERS** An interpreter is a program that treats source code (human-readable text) as data to be processed. The

BASIC program that comes on your PC-DOS diskette is probably the most familiar example of an interpreter. When you run a BASIC-language program, the BASIC.COM program sits between you and the

■ **MAKEBAR acts as an interface between the human menu writer and the SLASHBAR program, simplifying the tasks of both.**

computer, executing your instructions. You tell BASIC what you want it to do, and BASIC tells the PC what to do to accomplish it. Thus, the term *interpreter* is very appropriate.

The operation of an interpreter is not dependent on what has occurred previously or what will happen in the future. Each



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action is determined only by the current line of source code. The effect is one of executing each source code statement immediately, in much the same fashion as you would if you traced the source code by hand.

The reputation interpreters have for executing slowly is an unavoidable result of their method of operation. For example, if a program contains the statement  $A=B+C$  inside a loop, each iteration of the loop causes the interpreter to read and execute that statement as if it had come upon it for the first time. Each time the loop is executed, the line is read by the interpreter. First,

the address of the variable A is found in memory by consulting a reference table. Next, the = is read and understood to mean that the result on the right should be stored in the variable A, and so on. The interpreter has to perform this procedure each time this statement is encountered. The result is a smart program doing things in a dumb way. The fact that it works fast enough to be useful is partly due to the power of computers.

The advantages of an interpreter, however, can easily outweigh the disadvantages. Since the source code itself is executed, programming changes can be made

and tested rapidly. I often use BASIC to "rough out" code modules to ensure that the theory is sound. Interpreters usually have an interactive mode as well, in which normal program flow can be interrupted and variables can be examined or changed without the executing program's knowledge.

**COMPILERS** The term *compiler* describes a program that translates source code into a machine-readable form, instead of executing it. Compilers are usually associated with well-known programming languages, such as BASIC or Pascal.

```
! Sample BDF file for some DOS commands
PROGRAM "DGS"
```

```
MENU MAIN
```

```
OPTION FILE,"FILE HANDLING FUNCTIONS"
EXECUTE FILE
OPTION OISK,"OISK HANDLING FUNCTIONS"
EXECUTE DISK
OPTION SYSTEM,"SYSTEM MAINTENANCE"
EXECUTE SYSTEM
OPTION CLS,"CLEAR THE SCREEN"
TYPE "CLS[ENTER]"
```

```
HERD
```

```
MENU FILE
```

```
OPTION COPY,"COPY FILE(S)"
TYPE "COPY"
ASK "ENTER SOURCE FILE(S)"
INPUT
TYPE " "
ASK "COPY TO"
INPUT
CR
OPTION DIR,"DIRECTORY OF FILES"
TYPE "DIR "
ASK "WHAT DIRECTORY (ENTER = CURRENT)"
INPUT
CR
OPTION ERASE,"ERASE FILE(S)"
TYPE "ERASE "
ASK "ERASE WHAT FILE(S)"
INPUT
CR
OPTION RENAME,"RENAME FILE(S)"
TYPE "REN "
ASK "ENTER OLD FILE NAME"
INPUT
TYPE " "
ASK "ENTER NEW FILE NAME"
INPUT
CR
OPTION TYPE,"DISPLAY FILE(S)"
TYPE "TYPE "
ASK "OISPLAY WHAT FILE(S)"
INPUT
CR
```

```
HERO
```

```
MENU SYSTEM
```

```
OPTION DATE,"SET SYSTEM DATE"
TYPE "DATE "
ASK "ENTER DATE AS MM:DD:YY"
INPUT
CR
OPTION TIME,"SET SYSTEM TIME"
TYPE "TIME "
ASK "ENTER TIME AS MM:NN:SS"
INPUT
CR
OPTION PROMPT,"SET SYSTEM PROMPT"
TYPE "PROMPT "
```

```
ASK "ENTER NEW PROMPT"
```

```
INPUT
```

```
OPTION VER,"SHOW DOS VERSION"
TYPE "VER[ENTER]"
```

```
MENU
```

```
MENU OISK
```

```
OPTION ASSIGN,"CHANGE DRIVE ASSIGNMENT"
TYPE "ASSIGN "
```

```
ASK "WHAT DRIVE LETTER IS REFERENCED"
INPUT
TYPE " "
ASK "WHAT DRIVE SHOULD BE SUBSTITUTED"
```

```
INPUT
CR
```

```
OPTION CHDIR,"CHANGE DIRECTORIES"
TYPE "CD "
```

```
EXECUTE CHDIR
OPTION FORMAT,"FORMAT A OISK"
TYPE "FORMAT "
```

```
ASK "ENTER DRIVE LETTER"
INPUT
TYPE "i[ENTER]"
```

```
OPTION LABEL,"LABEL A OISK"
TYPE "LABEL "
ASK "ENTER DRIVE LETTER TO LABEL"
INPUT
CR
```

```
ASK "ENTER NEW LABEL"
INPUT
CR
```

```
OPTION MKDIR,"CREATE A SUBDIRECTORY"
TYPE "MD "
```

```
ASK "ENTER NAME OF SUBDIRECTORY TO CREATE"
INPUT
CR
```

```
OPTION RMDIR,"REMOVE A SUBDIRECTORY"
TYPE "RD "
```

```
ASK "ENTER NAME OF SUBDIRECTORY TO REMOVE"
INPUT
CR
```

```
OPTION VOL,"OISPLAY OISK VOLUME LABEL"
TYPE "VOL "
ASK "SHOW VOLDNE NAME OF WHAT DRIVE LETTER"
INPUT
TYPE "i[ENTER]"
```

```
MENU
```

```
MENU CHDIR
```

```
OPTION PARENT,"CHANGE TO PARENT DIRECTORY"
TYPE "CD ..[ENTER]"
```

```
OPTION ROOT,"CHANGE TO ROOT DIRECTORY"
TYPE "CD \[ENTER]"
```

```
OPTION OTHER,"SPECIFY SUBDIRECTORY"
ASK "ENTER SUBDIRECTORY"
INPUT
CR
```

```
MENU
```

```
END
```

Figure 3: A sample .BDF file for some DOS commands.



## ■ PC LAB NOTES

but are also available for such applications as *dBASE*. Using a compiler allows you to work efficiently with symbols and expressions with which humans are more familiar and fluent while providing the ability to generate native code, or "machine language," which is efficient for the computer to execute.

While an interpreter must read a program each time it is executed, a compiler reads and interprets the source code only once. When a statement like  $A=B+C$  is encountered, the actual addresses of the variables, along with the machine code instructions to add the quantities and store the result, are written to the output file. No matter how many times that statement is executed by the program, it will never have to be translated again. When the translation is complete, the compiler is no longer needed, and the resultant standalone code, after linking, can be executed directly by the operating system. (I'm considering the linking process to be part of the compiling process for the sake of this discussion.)

A program that has been compiled is usually more efficient and faster-running than the same program running under an interpreter. The price of this efficiency is inflexibility. To change the operation of the program, the source code must be edited and recompiled. If the program is large and complex, the time involved for compiling may not be trivial. Thus, many programmers like to combine methods, using an interpreter for development and compiling the final product to increase speed.

**TOKENIZERS** Tokenizing is a form of computer shorthand that compresses source code by representing frequently-used instructions and phrases as unique numerical values known as tokens. Tokenized source code occupies considerably less space than the original source code and may be produced as the code is read the first time. Unlike compiled code, tokenized code does not consist of machine-language instructions, and it is not executed directly by the computer. The format of the tokenized file is hardware independent. Tokenized code is simply source code in a compressed form. A BASIC program, saved without the ".A" parameter, is an example of a tokenized file. In the

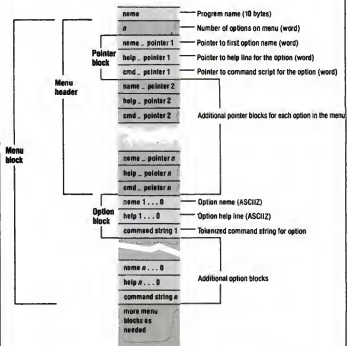
BASIC interpreter, the tokenizer is an integral part of the interpreter.

**A TOKENIZED FORMAT** SLASHBAR requires input files that are constructed in a specific format. MAKEBAR provides this format by combining some of the characteristics of a compiler with the ability of a tokenizer to compress source files. In the accompanying diagram, ".BAR File Schematic," the file starts with a ten-character name that will be displayed by the SLASHBAR utility in its window. The remainder of the file is constructed of menu modules. Each module begins with a header block. The header begins with a word (2 bytes) that indicates the number of options in the menu block. Im-

mediately following is a block of pointers. Each option in the menu block causes three pointers to be reserved in the output file. The first points to the option name, which is stored as an ASCII string (i.e., is terminated by a zero byte). The second points to the help text provided for that option. This is also stored in ASCII form. The third points to the address of the first command to be executed when this option is chosen. The pointer values are always the relative offsets of the items from the beginning of the .BAR file.

The commands for an option are stored in interpreter format, where any data required to perform a function is stored immediately following the function request. Instructions and data are stored sequential-

## .BAR File Schematic



ASCII strings may be any length and are terminated with a 0 byte.

Tokenized command strings end when an EXECUTE or SEND token is read.



ly in a single file, and program flow is continuously forward. (The only exception is the EXECUTE instruction, which repositions the instruction pointer. Program flow then proceeds forward again.)

**UNDERSTANDING MAKEBAR** The assembly language listing for MAKEBAR is well commented, and is an example of top-down design. To keep the .COM file as small as possible, I wrote MAKEBAR in assembly language. If size had not been a concern, however, I would have preferred to use the C language. As a result, programmers may notice a distinct C "flavor" in the procedure names and operation of the compiler.

**FILE HANDLING** The first order of business is performed by the OPEN\_FILES procedure, which calls the OPEN\_A\_FILE procedure twice, once each for the input and output filenames. An attempt is made to open the input file, but if it doesn't exist, an error message is displayed and the program terminates. The output file is opened with the Create File function call. This call will create the file if it doesn't exist, or truncate an existing file with the same name. The DOS file handle functions are used to open and manipulate the files, and so a full pathname may be specified.

When DOS loads a program, it formats an area in the Program Segment Prefix (PSP) to contain the characters that followed the program name on the command line. The PSP is located in the first 100h bytes of the Data Segment (DS register), and the characters are located at PSP:81h. The byte at PSP:80h contains the number of characters in the command line minus the trailing ENTER. The OPEN\_A\_FILE procedure scans this command line using the NON\_WHITE procedure is called to skip any leading blanks, tabs, or other "white-space" characters. Scanning ends when a nonwhite or a carriage return character is found. Assuming a name is found, WHITE is called to point past the end of the string, the file name is then copied to PATHBUF, and a 0 byte is appended to create an ASCIIZ format.

After the input file has been opened, characters are read using the GET\_CHAR procedure. The GET\_CHAR routine per-

forms buffered file input and detects an attempt to read past the end-of-file (EOF). The SI register is used to point to the current character in the buffer, and is preserved by any routine that uses it. SI can always be used to get the current character, but GET\_CHAR must be used to move SI to the next. If a call to GET\_CHAR causes the pointer to go past the end of the buffer,

## ■ MAKEBAR combines some characteristics of a compiler with the ability of a tokenizer to compress source files.

more characters are read from the source file. Comments are eliminated by GET\_CHAR when the file is read. If a semicolon is encountered, all following characters are skipped until the next carriage return.

**TOKENIZING** Once the files have been opened, control is passed to TOKENIZE. Two major operations occur in this procedure: the reduction of commands to tokens; and the resolution of intermenu references. Several counters and flags are used to keep track to the operation of the compiler, and these are initialized before processing begins.

In addition to WHITE and NON\_WHITE, several procedures are used to facilitate the parsing (separating into translatable quantities) of the source file. NEXT\_WORD skips to the first nonwhite character, on the same line, after the current word. NEXT\_LINE is used to skip past a carriage return character and is the only function that will do so. MAKE takes the word at SI and copies it to a scratch buffer. A zero byte is added to the end to make it an ASCIIZ string. Use of these procedures allows the source file to be handled with ease and simplifies processing the menu.

Except for comments and blank lines, each line of the source file must begin with a command. Therefore, the first step in processing is to determine if the first word on each line is a valid command. This is accomplished by the procedure TABLE\_LOOKUP, which takes two arguments. The first is a pointer to a list of strings in ASCIIZ format. In this case, CMD\_TABLE will be used. The second argument is a pointer to the ASCIIZ string to look up. If the entry is found in the table, the sequence number of the matching entry is returned in AL. This number is the token for that command. A nonmatching entry returns AL = FFh and processing terminates with an error.

As mentioned previously, PROGRAM must be the first command encountered, and it must occur only once. This condition is checked as the source file is processed, and a violation will produce an error message. The PROGRAM command must be followed by a quoted string containing the name of the menu.

All quoted strings are processed by the TKN\_STRING procedure. Since control is passed on the assumption that a quoted string follows, SI must point to a quote (") on entry, or an error is reported. Skipping past the opening quote, characters are read from the string and their ASCII values are placed in the output buffer. Special character names, surrounded by braces, are not output directly but are interpreted and translated.

**SPECIAL CHARACTERS** When a left brace is encountered inside a string, control is passed to the routine SPEC\_CHAR. The name of the character is removed from the braces and compared to entries in KEY\_NAME\_TBL by the TABLE\_LOOKUP procedure. If a valid token is not returned, an error is displayed. The three special keys {S}, {C}, and {A} are used to turn on Shift, Control, and Alt, respectively, for the next character. These tokens are used internally and are not written to the output buffer.

Some special keys, like Enter and Esc, produce ASCII codes. These codes are written directly to the output buffer. Other keys, however, such as the function keys F1 through F10, produce what are termed "extended ASCII" codes. When SLASH-



## ■ PC LAB NOTES

BAR is reconstructing the keystrokes, it needs to know when a key value is extended ASCII. To indicate this, a byte with the value FEh is put into the buffer ahead of each extended ASCII value. When SLASHBAR reads the string it will ignore the FEh and output the next byte as extended ASCII. When the closing quote is read, the string is terminated by writing a zero byte to the output file.

Once the PROGRAM command has been processed, MAKEBAR is ready to process menu blocks. Each menu block is treated as a unit and processed independently of the others. Nesting menus, by starting a new menu without closing the first one, or forgetting to terminate a menu block with a MEND command will produce an error message.

**THE POINTER PROBLEM** In the output file, each menu consists of a header block of pointers followed by the body of the block. Until the options are read and counted, the size of the header cannot be known. Paradoxically, however, in order for the options to be stored in the proper output buffer location (offset by the size of the header) as they are read, the header size must be known!

A two-pass compiler solves this problem by rereading the file and using the information gathered on the first pass to resolve the offsets. MAKEBAR, however, is designed to read through the source file only once, i.e., to be a single-pass compiler. By using a second internal buffer, however, it is possible to circumvent the apparent logical impossibility.

When a MENU command is parsed, a word is reserved in the output buffer to count the number of options in that menu. At the same time, a temporary buffer is initialized to hold the name, help line, and tokenized command string for each option as it is processed.

When an OPTION command is read, the option counter is incremented. The option name is then parsed and stored in the temporary buffer (pointed to by the BX register), while a pointer to contain the offset of the menu name relative to the beginning of the temporary buffer is created in the output buffer. But instead, the offset of the name from the beginning of the temporary buffer is placed in the pointer entry in

the output file. For the first entry in the temporary buffer, this value would be 0. (Reread this paragraph until you understand it, as it's crucial to the algorithm.)

The process is then repeated for the help line. The offset from the start of the temporary buffer is written to the second pointer entry for that option in the output file. Finally, the commands for that option are read, tokenized, and placed in the temporary buffer. A third pointer entry is created to point to the beginning of the command string. Thus, for each option in the menu

## ■ Once PROGRAM has been processed, MAKEBAR is ready to process menu blocks.

three pointer entries are created in the output buffer, while the information is stored in the temporary buffer.

When a MEND command is processed, the fun begins. Because the options have been counted, the size of the header and the relative offset of the first byte after the header are now known. After the contents of the temporary buffer are appended to the output buffer immediately following the header, the pointer values in the header, originally relative to the start of the temporary buffer, now have the relative offset of the byte after the header added to them. This converts the pointer values to relative offsets from the beginning of the output buffer. The process is actually simpler than it sounds.

**INSIDE THE OPTION BLOCK** Inside each option block, the commands are read, tokenized, and placed in the output buffer. Since INPUT and CR take no arguments, the token is enough information for SLASHBAR to perform the command. TYPE and ASK both take quoted strings as arguments. The processed strings are stored in ASCIIZ form immediately following the token. The final command, EXECUTE, is followed by a pointer to the start of the menu that is to be invoked. The

option block is closed when either another OPTION or a MEND command is read, and the SEND token is written to the output buffer.

The EXECUTE command takes as an argument the name of the menu to which control is to be transferred. In the output buffer, this becomes an EXECUTE token followed by the offset of the referenced menu from the start of the output buffer—or, more simply put, a goto. Since the top level menu block must appear first in the source file, all EXECUTE commands are forward references and the offsets of the target menus are not known. This creates a problem for our one-pass compiler for the same reason as was discussed in connection with the menu header, but it is solved in a slightly different fashion.

Menu names can appear in two places in the BDF format: as a name in a MENU command or as a target in an EXECUTE command. While a menu that is not the target of an EXECUTE command will not produce an error (consider the top-level menu), trying to execute a menu that does not exist, or executing it from more than one location, will produce an error. The SEARCH\_MENU\_TABLE procedure resolves all references to menu names.

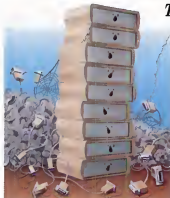
When MAKEBAR begins to process a file, a table is created to hold all menu references. The format for an entry is an ASCIIZ string followed by two words. When a MENU command is processed, SEARCH\_MENU\_TABLE is called in the *post* mode. This means that the offset of the menu is known and can be used to satisfy a reference. The name of the menu and the offset of the header in the output buffer are passed along to the SEARCH\_MENU\_TABLE procedure. If no entry for that name exists, one is created by storing the name of the menu, a word containing the offset of the menu header in the output buffer, and FFFFh in the second word to signal that this entry is posting an address. If a post entry for that name already exists in MENU\_NAME\_TBL, an error is reported.

When an EXECUTE command is processed, SEARCH\_MENU\_TABLE is called in the *request* mode, and is expected to return the address of the referenced menu. If a post entry is found in the table,



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## ■ PC LAB NOTES

the offset of the menu is returned and placed in the temporary buffer after the EXECUTE token. The second word of the entry is changed to FFFFh to indicate that the menu has been referenced. Referenc-

ing a menu more than once will produce an error.

Two other situations are possible. If SEARCH\_MENU\_TABLE is called to request an address and no entry exists in the

table for that name, an "IOU" is created by storing the name of the menu, the offset of the header of the menu that contains the request, and the offset of the requesting command from the end of the header. The absolute address cannot be supplied because the option block requesting it is still under construction. Then, a null reference is created in the temporary buffer where the menu address will be placed.

When a post call is made with the address of the referenced menu, an entry with that name will be found in the table. The second word will not be FFFFh or FFFFh, indicating that the entry contains an unfulfilled request. The address of the menu passed with the post call is stored directly into the output file, satisfying the forward reference. The first word following the name contains the offset of the menu header. The length of the header is calculated from the word at that location. Finally, the address containing the null reference to be replaced may be determined by adding the offset of the menu header, the length of the header, and the offset past the header of the null reference (stored in the second word of the table entry).

The END command indicates that processing of the input file is complete. After checking for any open blocks and bad references, the output buffer is written to the output file as one operation. The output file is then closed to update the time, date, and length data and the program is ended.

**CONCLUSION** MAKEBAR and SLASHBAR are separate modules of what is a single programming system. SLASHBAR performs the interpretation and execution of the commands, while MAKEBAR tokenizes and resolves address references as a compiler. The net result, combined with the design of suitable .BDF menu files for your applications, will let you give your programs the look and feel of 1-2-3. *[A final note: Not all programs handle keyboard input identically, and space precludes adding an 800-byte table to cover all possible codes. It is thus possible that some application commands may not be usable in this menu file—Ed.]*

Robert L. Hummel has joined the staff of PC Magazine as an additional technical editor.

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## ■ PROGRAMMING/UTILITIES

Before you can use SLASHBAR.COM, however, remember that it is only one of two parts that make up this memory-resident utility. The SLASHBAR.COM file contains all the logic needed to pop up a menu window on the screen and interpret replies. The second part of the utility is the specific bar-menu file you must create for each application. The bar-menu file contains the choices and instructions needed to operate the application program through the SLASHBAR interface. Complete instructions and examples for creating the menus are given in the PC Lab Notes column in this issue. In this discussion, I'll use the same sample DOS menu presented in that column.

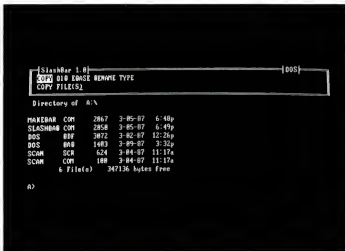
Once you have both SLASHBAR.COM and a suitable menu, you execute the program at the DOS prompt by entering the command

```
SLASHBAR [path]menuname.ext [/n]
```

where *menuname.ext* is the name of the compiled bar-menu file (which usually has a .BAR extension), and the */n* parameter is used to reserve enough memory, in bytes, when the program first loads for the largest .BAR file you intend to use. If no */n* parameter is specified, SLASHBAR will set aside a 4096-byte buffer. The upper limit for *n* is approximately 60K, which is more than the largest .BAR file that can be produced by the MAKEBAR compiler. If you attempt to load a file that is larger than the current SLASHBAR buffer, an error message will be displayed.

When SLASHBAR is executed the first time, it becomes memory resident and decreases the available memory. The .BAR file specified on the command line is loaded into the program buffer and is displayed when the menu is activated. Executing SLASHBAR again, with a different .BAR file, will copy the new file into the buffer of the resident copy. SLASHBAR checks to see if it is already resident, and may be executed as many times as you desire without using additional memory.

Once SLASHBAR is loaded, pressing the Alt-Slash key (/) key combination will pop up a two-line menu window on the screen. The accompanying screen shot shows what the second level looks like for the DOS.BAR menu. The name given to



A screen shot of the second-level DOS.BAR menu, called up over a directory listing.

menu appears in the window border on the far right. This reminder helps ensure that the menu that is loaded matches the current application. All available options are listed on the first line in the menu, with the current choice displayed in reverse video on a monochrome monitor, or in distinct colors on a color monitor. Below the options, a help line is displayed for the current menu selection.

Menu options can be selected in two ways. The reverse video cursor bar may be moved using the Home, End, Right Arrow, and Left Arrow keys until the cursor bar is on the desired menu selection. As each option is highlighted, the help line changes to explain that selection. Pressing Enter will then cause the current menu option to be executed. This method is helpful while trying to learn a new application or searching for a forgotten command.

As your proficiency grows, however, the point-and-shoot interface tends to become tedious. Less what was once helpful become a hindrance, the SLASHBAR interface allows an alternative way to select menu options. Simply by pressing the first letter of the desired menu option, that option will be selected and executed immediately. The effect is exactly the same as if you had selected the option with the video bar and pressed Enter.

Movement along the menu tree is usually one-way. As options are selected, you proceed down the tree until you find the command to be executed. If you select the wrong option, however, or make a mistake while entering text, the Escape key allows you to "back out." Pressing Esc repeatedly will eventually bring you back to the top level and close the window.

SLASHBAR is a well-behaved resident program and should be compatible with most other resident programs. It will work with any applications program that uses the BIOS interrupt 16h to retrieve keystrokes. Applications that handle the keyboard directly will not be usable with SLASHBAR. Because it places keystrokes directly into the keyboard buffer, other programs that act similarly may cause a conflict.

**PATCHING THE HOT KEY** Many applications make extensive use of the keyboard and leave few key combinations unused. If one of your applications uses the Alt-Slash key combination, you can patch SLASHBAR.COM to use the "hot key" of your choice. At the beginning of the assembly language listing for SLASHBAR (Figure 1) there are two equates, labeled HOTKEY and SHIFT\_MASK. Changing these equates and reassembling (use the



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(Figure 1 continued)



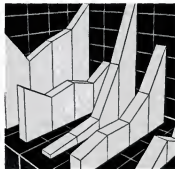
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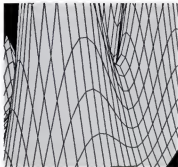
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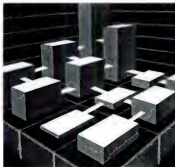
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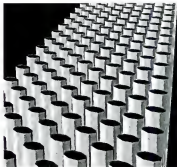
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## ■ PROGRAMMING/UTILITIES

[illegible]

(Figure 1 ends)

Microsoft or IBM Macro Assembler, Version 2.0 or later) will produce a new version of SLASHBAR that uses your designated hotkey. If you don't have an assembler, you can patch the .COM file directly with DEBUG, using the following instructions.

The value used for HOTKEY is the "make-scan code" of the key that is reported by INT 9. This code can be determined by simply looking it up in the accompanying table "Keyboard Scan Codes for Alternative Hot Keys."

The second part of the hot-key modification involves the shift status. There are four "shift" keys: Alt, Ctrl, Left Shift, and Right Shift. (The IBM Enhanced Keyboard has two Alt and Ctrl keys, but for our purposes, they generate the same scan code.) The SHIFT\_MASK value is deter-

- The DOS version is checked because SLASHBAR uses some DOS functions available in DOS 2.0 and later.

mined by which shift keys must be pressed at the same time as the hot key, to activate SLASHBAR. Use the "SHIFT\_MASK Value Table" to determine the value to use for SHIFT\_MASK. You'll note both from this table and from the .ASM listing in Fig-

ure 1 that the program default—the Alt key—has the value of 08.

Once you've got the values you want to use for the HOTKEY scan code and SHIFT\_MASK, you're ready to patch SLASHBAR.COM directly using DEBUG. Working with a copy of SLASHBAR.COM, in case you make a mistake, follow the example below, substituting your selected scan code where you see SS to replace the 35 default at offset 167, and the shift mask code where you see MM. All numbers are in hex, and you don't have to type the semicolons or anything to the right of them.

```
DEBUG SLASHBAR.COM
E 167 SS          ;Scan code here
E 171 MM          ;Shift mask here
W
Q
```





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## ■ PROGRAMMING/UTILITIES

### SHIFT-MASK Value Table

SHIFT-MASK Value	Shift key (● = Pressed)			
	Alt	Ctrl	Left Shift	Right Shift
0				
1				●
2			●	
3			●	●
4		●		
5		●		●
6		●	●	
7		●	●	●
8	●			
9	●			●
A	●		●	
B	●		●	●
C	●	●		
D	●	●		●
E			●	
F	●	●	●	●

**INSIDE SLASHBAR** While you can successfully use SLASHBAR without looking at the material below, many readers are interested in how the programs presented in this column work. Whenever the SLASHBAR.COM file is executed, control is transferred to the INITIALIZE procedure. Here, after the copyright notice is displayed, a procedure is called to check the DOS version. This is necessary because SLASHBAR uses some DOS functions that are available only in DOS 2.0 and later. Interrupt 21h function 30h reports the same version as you see when you execute the DOS VER command.

The INITIALIZE procedure performs two major functions. The first is to determine if a resident copy of SLASHBAR already exists, and if not, to load one. SLASHBAR determines this by searching for its copyright notice in memory. If a previously loaded copy is found, the ES register is set to the segment of the resident copy. The second function is to copy the contents of the specified file into the file buffer of the resident copy pointed to by the ES register.

When DOS executes a program, any characters on the command line are copied to an area at offset 80h in the Program Segment Prefix (PSP). This area is scanned for

the /n buffer size parameter. The /n switch must follow the filename and is ignored if SLASHBAR is already resident. (The only way to change the buffer size is to reboot the computer to remove SLASHBAR from memory and execute it again with a larger /n.) If the /n switch is found, up to five following digits are read and converted to a number. Because of the addressing scheme used, the entire memory image, including the file buffer, must fit in a 64K segment. If a buffer size that would exceed this limit is requested, an error message is produced. (The largest file the MAKEBAR compiler can produce is 46,000 bytes, so this should present no problem.)

The second major function of SLASHBAR is as a file loader. While the /n pa-

rameter is optional, the name of a compiled menu file must always be specified. (Note that SLASHBAR does not check to see if the file contents are valid. Any file may be loaded, but the probable result is a cold reboot.) The filename may also include a path, if desired. The file parameter must be the first argument on the command line and is opened using the DOS file handle functions.

**POINTER POWER** If the menu file is opened successfully, its size must be found to ensure that it will fit the resident buffer. When DOS opens a file with a handle, it keeps track of its position in the file with a handle pointer. Reading or writing to the file causes the value of the pointer to reflect

### Keyboard Scan Codes for Alternative Hot Keys

Key	Scan code in hex
Esc	01
1	07
2	09
3	0B
4	0D
5	0E
6	0F
7	10
8	11
9	12
0	13
-	14
=	15
Backspace	16
Tab	17
P	1A
R	1B
L	1C
T	1D
Y	1E
P	1F
I	20
O	21
P	22
Enter	23
Ctrl	24
P	25
S	26
P	27
F	28
P	29
T	2A
P	2B
L	2C
P	2D
P	2E
P	2F
Left Shift	2A
Right Shift	2B

Key	Scan code in hex
Z	2C
X	2D
C	2E
V	2F
B	30
N	31
M	32
<	33
>	34
?	35
Right Shift	36
Print	37
Alt	38
Spacebar	39
Caps Lock	3A
F1	3B
F2	3C
F3	3D
F4	3E
F5	3F
F6	40
F7	41
F8	42
F9	43
F10	44
NumLock	45
ScrollLock	46
7 Home	47
8 Up Arrow	48
9 PgUp	49
—	4A
4 Left Arrow	4B
5	4C
6 Right Arrow	4D
+	4E
1 End	4F
2 Down Arrow	50
3 PgDn	51
0 Ins	52
Del	53



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## ■ PROGRAMMING/UTILITIES

```

188 REM --- BASIC PROGRAM TO CREATE SLASHBAR.COM
189 DIM PRM$(SLASHBAR.COM) AS 1 LEN = 1
190 FIELD #1 AS AF
191 CHECKSUM = 0
192 FOR I = 1 TO 253
193   LINENUM = 0
194   FOR J = 1 TO 8
195     READ BYTE
196     CHECKSUM = CHECKSUM + BYTE
197   NEXT J
198   LINENUM = LINENUM + BYTE
199   IF (BYTE < 256) THEN GOTO AF = (BYTE)
200 NEXT I
201 REM #1
202 REM #2
203 REM #3
204 REM #4
205 REM #5
206 REM #6
207 REM #7
208 REM #8
209 REM #9
210 REM #10
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1498 DATA	8	233	65	255	232	289	1	198	1	2188 DATA	242	48	8	235	195	131	238	1	1881
1508 DATA	115	145	133	35	14	235	3	178	63	2198 DATA	25	14	18	178	174	32	138	3	836
1518 DATA	18	192	116	152	68	254	117	14	915	2208 DATA	183	3	232	56	255	255	177	11	1352
1528 DATA	172	68	254	177	7	184	18	28	318	2218 DATA	281	117	144	249	235	17	21	281	175
1538 DATA	225	34	134	234	232	38	188	26	3188	2228 DATA	116	3	289	231	198	184	253	1128	
1548 DATA	68	33	114	24	188	1	68	27	481	2238 DATA	173	232	96	255	228	258	248	94	1574
1558 DATA	116	38	188	34	68	9	116	12	524	2248 DATA	89	88	195	88	184	7	14	232	188
1568 DATA	68	137	116	8	254	196	48	938	2258 DATA	52	251	188	135	47	118	8	859		
1578 DATA	116	2	58	238	232	188	1	235	973	2268 DATA	111	111	32	66	185	183	26	78	434
1588 DATA	194	238	28	155	3	58	38	157	769	2278 DATA	185	185	183	32	64	212	111	32	888
1598 DATA	3	116	51	128	62	68	3	62	62	2288 DATA	185	185	183	36	69	114	114	114	718
1608 DATA	116	18	131	46	155	3	2	131	594	2298 DATA	114	32	79	112	181	118	185	118	763
1618 DATA	235	2	235	9	138	38	187	3	618	2308 DATA	183	32	78	185	188	181	36	85	448
1628 DATA	131	6	187	3	2	138	15	38	403	2318 DATA	113	97	183	181	58	32	83	76	465
1638 DATA	91	192	242	216	187	26	4	258	1848	2328 DATA	65	83	73	66	65	82	32	91	536
1648 DATA	199	7	28	216	187	71	3	32	148	2338 DATA	112	97	116	44	93	188	181	118	842
1658 DATA	8	137	79	4	231	195	378	936	2348 DATA	117	118	97	188	181	68	181	128	881	
1668 DATA	62	151	3	289	231	139	189	64	1848	2358 DATA	116	32	91	47	118	93	188	712	
1678 DATA	14	185	189	6	182	3	1	388	787	2368 DATA	3	1	188	8	285	33	232	67	738
1688 DATA	6	181	3	1	51	238	139	14	685	2378 DATA	1	189	6	1	8	1	195	486	
1698 DATA	153	2	232	228	255	119	115	2	1125	2388 DATA	6	2	1	8	51	219	148	419	
1708 DATA	3	243	138	38	183	3	176	32	818	2398 DATA	288	67	142	195	58	192	116	148	888
1718 DATA	254	6	181	3	232	198	8	97	922	2408 DATA	198	8	1	138	254	385	36	8	785
1728 DATA	282	248	3	337	4	138	38	384	655	2418 DATA	242	167	11	281	117	235	255	788	1278
1738 DATA	3	252	162	8	66	131	195	6	789	2428 DATA	181	128	8	118	3	58	237	73	628
1748 DATA	236	219	185	198	6	182	3	2	1833	2438 DATA	176	47	242	174	237	56	239	247	1388
1758 DATA	198	6	181	3	8	232	175	255	1853	2448 DATA	79	198	5	13	151	18	8	185	681
1768 DATA	243	243	243	243	243	243	243	243	243	2458 DATA	5	23	23	173	44	6	188	188	188
1778 DATA	248	139	25	4	3	245	238	38	918	2468 DATA	9	118	9	147	247	231	58	255	1867
1788 DATA	248	139	25	4	3	245	238	38	918	2478 DATA	5	216	226	248	137	38	147	3	1882
1798 DATA	285	23	195	129	38	149	3	139	82	2488 DATA	51	192	12	65	188	148	148	148	756
1808 DATA	14	153	3	73	238	252	77	117	817	2498 DATA	119	13	186	36	188	9	285	754	
1818 DATA	8	25	23	73	238	252	77	117	817	2508 DATA	119	13	186	36	188	9	285	754	
1828 DATA	235	18	128	252	73	117	18	75	982	2518 DATA	8	172	68	32	116	253	68	33	794
1838 DATA	121	7	139	237	137	18	149	3	798	2528 DATA	117	5	186	79	7	235	238	119	598
1848 DATA	128	252	73	117	18	75	982	2538 DATA	234	74	242	32	116	253	68	33	794		
1858 DATA	79	134	239	232	5	1	195	68	975	2548 DATA	32	117	247	78	188	4	8	184	841
1868 DATA	97	216	4	6	48	122	119	2	44	2558 DATA	8	81	285	33	118	5	186	68	665
1878 DATA	62	68	62	77	6	176	255	686	2568 DATA	67	235	288	118	216	181	6	188	188	
1888 DATA	248	195	139	216	141	149	3	128	1239	2578 DATA	51	281	51	238	285	33	114	238	1183
1898 DATA	251	13	116	246	51	218	139	14	1818	2588 DATA	59	8	147	3	118	5	186	47	573
1908 DATA	352	3	232	58	255	139	115	2	957	2598 DATA	7	235	178	88	184	8	6	188	188
1918 DATA	3	245	172	58	199	116	8	66	863	2608 DATA	281	51	238	285	33	89	114	214	1117
1928 DATA	131	131	131	131	131	131	131	131	131	2618 DATA	186	63	186	63	186	63	186	63	186
1938 DATA	194	163	149	3	235	218	172	18	1136	2628 DATA	285	33	32	114	281	188	42	285	1831
1948 DATA	152	136	9	332	7	8	254	6	816	2638 DATA	148	281	148	195	59	281	114	1887	
1958 DATA	181	242	195	88	12	81	188	8	188	2648 DATA	52	385	33	137	38	45	1	248	683
1968 DATA	232	37	8	185	1	8	138	228	813	2658 DATA	6	87	1	7	176	9	381	72	558
1978 DATA	188	8	138	62	91	1	232	33	726	2668 DATA	6	87	1	7	176	9	381	72	558
1988 DATA	252	89	81	88	185	184	8	6	885	2678 DATA	1	184	98	2	232	85	4	276	788
1998 DATA	381	1	182	2	177	1	178	78	888	2688 DATA	23	181	77	1	186	69	3	232	781
2008 DATA	138	62	183	3	232	247	251	195	1311	2698 DATA	84	8	176	33	181	81	3	184	752
2018 DATA	68	138	68	138	68	138	68	138	778	2708 DATA	24	7	235	178	88	184	8	6	188
2028 DATA	2	138	62	91	1	232	238	251	1887	2718 DATA	142	182	188	73	185	33	186	142	1354
2038 DATA	98	91	85	85	85	85	85	85	85	2728 DATA	14	3	23	147	3	177	4	211	181
2048 DATA	155	7	139	237	139	223	184	11	981	2738 DATA	24	8	68	285	33	83	188	896	
2058 DATA	129	248	8	2	116	7	137	7	647	2748 DATA	87	114	88	97	114	56	32	48	683
2068 DATA	121	1	155	3	2	89	91	198	672	2758 DATA	92	181	117	185	114	181	115	848	
2078 DATA	98	81	66	198	6	182	3	2	630	2768 DATA	32	68	79	83	32	58	46	48	438
2088 DATA	198	6	181	3	1	232	192	255	1848	2778 DATA	43	18	36	188	48	285	32	568	
2098 DATA	244	18	138	62	91	2	385	782	2788 DATA	68	2	115	186	146	6	188	146	6	859
2108 DATA	78	8	232	169	251	198	184	33	1837	2798 DATA	9	285	33	285	32	195	8	88	765
2118 DATA	139	286	129	233	184	13	252	187	1233	2808 DATA	188	51	285	99	117	29	148	69	846
2128 DATA	25	284	25	284	25	284	25	284	1541	2818 DATA	3	68	188	37	185	33	7	195	747
2138 DATA	68	13	116	64	68	27	116	55	523										
2148 DATA	68	8	116	24	129	249	152	8	738										

portion of SLASHBAR, the procedure sets memory aside for buffers needed for normal operation. These buffers are listed at the end of the assembly listing.

If the resident copy of SLASHBAR is to gain control of the computer, it must be able to detect when its hot-key combination has been typed. Each time a key is pressed on the PC, the keyboard generates an INT 9 to pass control to the BIOS. SLASHBAR splices into INT 9 by saving the current interrupt handler address and substituting the address of its own keyboard routine. This is done with the DOS INT 21h functions 25h, "Set interrupt vector," and 35h, "Get interrupt Vector."

## ■ If SLASHBAR is not executing for the first time, it functions simply as a file loader.

SLASHBAR now monitors the scan codes reported by interrupt 9 as the keys are typed. If the scan code for the (/ slash) key is reported, the status of the shift keys

is checked. If the Alt key is also pressed, SLASHBAR interprets this as a request to pop up. Other combinations are passed to the regular keyboard handler.

The ability to pop up while other programs are running has some drawbacks. Because current versions of DOS are not designed to support multiple programs, misbehaved programs can do irreparable harm to DOS's internal structure and cause the PC to hang. To prevent SLASHBAR from appearing when it shouldn't, some anti-pop-up features have been included in its design. Perhaps the most obvious is to prevent SLASHBAR from popping up inside itself. A 1-byte location in memory



## ■ PROGRAMMING/UTILITIES

(called **ACTIVE** in the ASM listing) keeps track of the state of **SLASHBAR**. Normally, this location contains a value of zero. When **SLASHBAR** detects an Alt-Slash key combination and prepares to pop up, it checks this location first. If **ACTIVE** still contains the zero, the process is allowed to continue and a 1 is stored in **ACTIVE** to indicate a busy condition. If **ACTIVE** is nonzero, **SLASHBAR** assumes it is already active, and the keystroke is ignored.

**SLASHBAR** is, in essence, a keyboard macro program that translates a menu command into a series of keystrokes. Up to 256 keys may be stored for any single menu command. To pass these keys to the application program, **INT 16h**, the BIOS keyboard interrupt, is used. (Don't confuse this with **INT 9**, which is a hardware interrupt generated by the keyboard controller.) **INT 16** is a software interrupt used to remove keys from the BIOS buffer located in low memory. To prevent menu keys from being mixed with keys that may already be in the buffer, **SLASHBAR** will not pop up unless the BIOS keyboard buffer is empty.

**THE DOS CRITICAL FLAG** Resident programs that interrupt DOS at the wrong moment can put a lot of wear on the big red switch. To prevent **SLASHBAR** from becoming more trouble than it is worth, an undocumented (that is, unsupported) DOS function is used to obtain the address of the "DOS Critical Flag." This is a 1-byte area in low memory that DOS uses to signal that it is inside an **INT 21h** function call and should not be interrupted. I've personally tested the function call successfully in all PC-DOS versions from 2.0 to 3.2. Although not listed in the IBM *Technical Reference* manual, this call has been mentioned in the *Microsoft Systems Journal* (Volume 1 Number 2) as part of the long-awaited TSR standard. The address of the Critical Flag is retrieved and saved when **SLASHBAR** is installed. Each time the hot-key combination is pressed, this byte is checked for a busy signal.

Making a decision to pop up based on the critical flag alone, however, would mean that **SLASHBAR** would not pop up inside programs that use the DOS keyboard input functions. These include **DEBUG**, **EDLIN**, and **DOS** itself. Clearly,

such a restriction would be too severe, and fortunately it is really unnecessary. Because of the way that DOS operates internally, other functions can continue with no ill effects while **INT 21h** functions 01h through 0Ch are active. By splicing into the DOS **INT 21h** function call, we can set an internal flag, **LO\_FN\_FLAG**, to non-zero when DOS is using one of these interruptible function calls. If the DOS Critical Flag is set but the **LO\_FN\_FLAG** is set as well, **SLASHBAR** proceeds to pop up.

The interception of an interrupt is usu-

ally transparent to the system. **INT 21h** is an exception. Function 0, the old-style "Program terminate," requires that the CS register contain the segment of the Program Segment Prefix for the program to be terminated. The CS value is determined by checking the value pushed onto the stack by the **INT** instruction. By intercepting **INT 21h**, **SLASHBAR** changes the CS value passed to the function handler. The program-terminate call fails and causes DOS to halt with a memory allocation error. **SLASHBAR** bypasses this problem

## DOWNLOADING SLASHBAR

The programs that appear in our Programming/Utilities column (as well as other programs we publish) can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. You may make copies for others (including placement on noncommercial electronic bulletin boards), as long as no charge is involved. However, making copies for any commercial purpose is strictly prohibited.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1,200 (or 300) bps, 8 data bits, 1 stop bit, no

parity. PC-IRS files with a .COM, .EXE, or .ARC extension require that you also use the Xmodem error-checking protocol; other files (e.g., with extensions of .ASM or .BAS) can be downloaded using either regular ASCII or Xmodem transmission.

**SLASHBAR.BAS**, whether typed in from the magazine at your keyboard or downloaded from PC-IRS, will automatically create **SLASHBAR.COM** when run once in BASIC. **SLASHBAR.ASM**, also listed both here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft) and the commands:

```

MASM SLASHBAR;
LINK SLASHBAR;
EXE2BIN SLASHBAR SLASHBAR.COM

```

### SLASHBAR at a Glance

**SLASHBAR** is a memory-resident utility that provides a pop-up window and interpreter for a Lotus-style control menu. The menu is intended to contain the commands needed to run non-Lotus applications programs. Menus must be prepared in the format described in and compiled using the **MAKEBAR.COM** program presented in this issue's PC Lab Notes column.

The syntax for **SLASHBAR** is

```
SLASHBAR [path]menuname.ext [/n]
```

where **menuname.ext** is the name of the compiled bar-menu file (which usually has a .BAR extension). When **SLASHBAR** is first loaded, the **/n** parameter (in bytes) is used to reserve sufficient room in memory for the largest .BAR file that will be used during the current session. The default value for **n** is 4096 bytes, and its upper limit is approximately 60K, which is more than the largest .BAR file that can be produced by the **MAKEBAR** compiler.

The Alt-/key combination is used to activate the pop-up menu.



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## PRODUCTIVITY

### ■ PROGRAMMING

by substituting the newer function 4Ch, "Terminate a process," for function 0. This substitution produces the same effect as the original function and is transparent.

**VIDEO HANDLING** SLASHBAR is designed to function in the normal video-text modes of the PC and will not pop up in a graphics mode. This restriction was imposed to keep the program small, but ambitious programmers could modify the assembly language listing to provide this capability. SLASHBAR will, however, pop up in the 40-column text modes of the color/graphics adapter (CGA). This was allowed to accommodate users who have used mode 0 or 1 to invoke a special EGA mode (such as the 120-column mode de-

■ All of SLASHBAR's screen handling is performed through the BIOS Video Service.

scribed by Charles Petzold in *PC Magazine*, Volume 5 Number 15).

If all goes well up to this point, SLASHBAR is ready to pop up on the screen. The current stack segment and stack pointer (SS and SP registers) are saved in local memory and switched to point to an internal stack. There's an important reason for this step. SLASHBAR uses the BP register as a pointer to the start of the compiled menu file. By default, the 8088 uses SS to calculate all references to BP. When SLASHBAR is resident, however, we want all references relative to the CS register, which points to the segment that contains the code and data. By setting SS to point to the same segment as CS, we can use the BP register without worrying about segments.

To achieve maximum compatibility, all of SLASHBAR's screen handling is performed through the BIOS Video Service, INT 10h. This interrupt is not invoked directly but is made by calling the VIDEO procedure. Some older versions of the IBM BIOS change the value of the BP reg-



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## ■ PROGRAMMING/UTILITIES

ister during certain video functions. By surrounding the interrupt with a PUSH BP/POP BP pair of instructions, potential problems are eliminated. The current cursor location and video page are saved in local storage. Then, the SCREEN procedure is used to save the portion of the screen that will be overwritten.

The SCREEN procedure serves a dual purpose and takes advantage of the similarity between the save and restore operations to minimize the size of the code. The contents of the SI and DI registers determine if a screen save or restore is to be performed. The workhorses of the procedure are the BIOS video functions 8 (Get character and attribute) and 9 (Write character and attribute).

**REGISTER USAGE** The .BAR file format is designed to make it easy for SLASHBAR to execute. To this end, certain registers are assigned dedicated uses throughout the program. The BP register always contains the absolute location in the segment of the beginning of the .BAR script, for example. Because all addresses in the script are offsets from the beginning, the real address of the item can be found by adding the offset to the value in the BP register. The DI register is used to hold the offset of the current menu header. Care is taken across procedure and function calls to preserve these registers.

The Intel 8088 family also endows certain registers with special characteristics. When calculating an effective address, only the BP, SI, DI, and BX registers may be used. The registers may be used in almost any combination except that the BX register cannot be used with the BP register. So, for example, if BP contains the location of the beginning of the .BAR script (BP = 1234h), and SI contains the offset of a menu from the beginning of the script (SI = 0104h), [BP+SI] refers to the absolute location of that menu in the segment (1338h). (The brackets indicate that the value is not BP + SI, but the contents of the location pointed to by BP + SI and may also be written [BP][SI].)

As options are chosen that cause submenus to be displayed, the offsets of the previous menus are saved in the MENU\_STK array in much the same way as a return address is saved during a subroutine

call. Should there be a need to back out of a menu, the previous menu offset is loaded from MENU\_STACK and execution continues at that point. The LEVEL variable is used as an index to determine the current menu address.

Because executing a menu option may have caused keys to be stored in the KEYS buffer, the location of the last valid character is similarly stored in the KEY\_STK array. KEY\_PTR is restored to this value in the same way as is the menu address. Thus, backing out of a menu erases any added keystrokes.

Several arrays and variables are initialized on entry to the MENU\_TIME procedure. The address of the first menu is placed in MENU\_STK and the name of the menu, as stored in the .BAR file, is written in the corner of the window.

**SCREENING MENUS** Building the menu on screen is a straightforward procedure when broken down into logical steps. The inside of the dialogue box is cleared using the CLR\_LINES procedure. Then, using the LEVEL variable, the offset of the current menu header is loaded into the DI register. Figure 3 shows the format of the menu header. The word at [BP][DI] contains the number of options in the menu and is stored in NOPT.

The WRITE\_NAMES procedure steps through the header to find and display the option names on the first line of the window. The option pointed to by the OPT\_PTR variable is displayed in reverse video or distinctive colors. WRITE

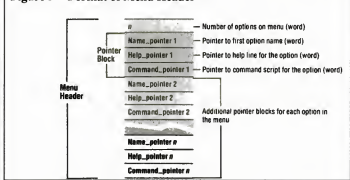
\_HELP is called next to display the help line for the option highlighted on the screen. With the menu now constructed, GET\_KEY is called to wait for input from the keyboard.

There are two valid ways of selecting an option. The cursor bar can be moved with the Home, End, and Left or Right Arrow keys. The positioning of the cursor bar is handled by the MOVE\_BAR procedure, which keeps track of the current option, updates the OPT\_PTR variable, and wraps the cursor when it gets to either side of the menu.

If GET\_KEY returns an ASCII key, the value is converted to uppercase by MAKE\_UC. MATCH\_KEY is then called to interpret the key. The Esc key is used to back the menu up by one level. This is signaled by returning FFh in AL. If the menu is currently at the top level, the window is closed and control returns to the application. The Enter key has the opposite effect, causing the number of the current option to be returned in AL. Finally, the first letter of the option names are scanned, from left to right, to find a match. If a match is found, the number of the option is returned in AL. The carry flag is set if no match is found; otherwise, it is cleared.

When an option is selected, the offset of the command script is determined from the menu header and the interpretation of the commands begins. SI is used to point to the real address of the script in memory so that instructions and data can be retrieved with the LODSB and LODSW instructions. A byte containing a command token

Figure 3—Format of Menu Header







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## ■ PROGRAMMING/UTILITIES

is read from the script and then used as an index into a jump table. Invalid token values pass control over to an error routine that exits the menu. Other token values pass control over to routines that imple-

ment specific functions. Each function other than EXECUTE and SEND returns to read the next instruction.

The ASK command clears the menu window and copies characters from the

script to the screen until a zero byte is read. The CR command places the code for the Enter key into the KEYS buffer. It is really a special case of the TYPE command. TYPE is more general and copies characters from the script to the KEYS buffer until a zero byte is read. To save space and simplify the translation, the scan codes for ASCII characters, normally returned by the BIOS in AH, are not placed in the .BAR file. When the characters are read by TYPE and placed in the KEYS buffer, they are expanded to 2 bytes to mimic the information returned by INT 16h. The upper byte is set to zero.

(While testing SLASHBAR, I found only one application program that made use of the upper byte. When the Return, Esc, Backspace, or Tab characters were placed in the buffer with the high byte at zero, WordPerfect interpreted them as characters instead of control keys. So for those four keys, a value for the scan code is placed in the high byte.)

The INPUT command performs buffered keyboard input from the keyboard and displays the characters on the second line of the window as they are typed. Characters can be erased one at a time with the Backspace key, and the entire line can be cleared by pressing Esc.

An option block can terminate in either of two ways. The first is with an EXECUTE command. This transfers control to a new menu. The LEVEL is incremented and the old menu offset and KEY\_PTR are saved on their stacks. The new menu is built on the screen and then the process continues.

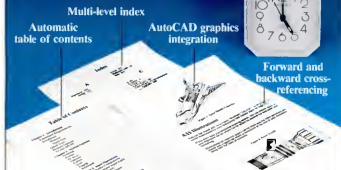
The second way an option block can end is when the SEND token is read from the script file. SEND is a BDF command code inserted in the .BAR file by the compiler to tell SLASHBAR that the menu command is complete and the buffered keystrokes should be sent to the application program. The SEND routine checks to see if the buffer is empty, and, if so, exits the menu with no further action.

Many keyboard enhancement programs use the Hardware Timer Tick interrupt (INT 8) to periodically check the BIOS keyboard buffer and add or modify keystrokes. Intercepting INT 8, however, has some inherent problems associated with it. Because the timer tick occurs ap-

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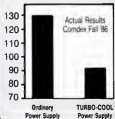
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proximately 18.2 times each second, the time spent servicing the interrupt can have a measurable effect on the effective speed of your PC. (Several programs designed to slow the AT down to XT speed for game playing do nothing more than waste time inside INT 8.) Thus, SLASHBAR uses a slightly different approach and avoids using INT 8 at all.

The INT\_16 procedure in the SLASHBAR program is designed to work in conjunction with the BIOS INT 16h as a "data switch." The BIOS INT 16h call has three functions. When AH=2, the BIOS returns the status of the Shift keys. This request is always made with a FAR JUMP.

When AH=1, the calling program wants to know if any keys are in the buffer. This call is usually made so that if there aren't any keys ready, other actions can be performed. The AH=0 function causes the BIOS either to return the next available key from the buffer or to enter a wait loop until a key is pressed. Each time an INT 16h is executed with AH=0 or AH=1, SLASHBAR checks to see if there are any keys stored in the KEYS buffer. If there are, they are fed to the calling program and the BIOS routine is never invoked. When the KEYS buffer is empty, the requests are passed through to the BIOS as normal. When SLASHBAR is active, all keyboard function requests are passed through to the BIOS. If they weren't, SLASHBAR would read the characters put into the KEYS buffer as responses to its own request for input.

The only problem with this approach arises when SLASHBAR's INT\_16 procedure has keys available and is waiting for an INT 16 call to request them, and the BIOS is already inside an INT 16. If no key is ready when the wait-for-key call is made, the BIOS enters a wait loop that checks the BIOS keyboard buffer periodically to see if an INT 9 has placed any keys in it but does not issue another INT 16. The result is a stalemate.

**PUMP PRIMING** SLASHBAR breaks the deadlock by priming the pump, so to speak. If the last call made to the BIOS before SLASHBAR became active was AH=0 (Wait-for-key), the first key of the string built by SLASHBAR is placed in the BIOS keyboard buffer with interrupts dis-



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abled. When interrupts are reactivated, the BIOS detects it, exits its wait loop and returns the key to the calling application. All further INT 16h calls remove keys from the KEYS buffer until it has been emptied. If the BIOS call was AH=1, however, the last key in the SLASHBAR string is placed in the BIOS buffer. When the BIOS returns and reports that a key is ready, the next call will begin to remove keys from the SLASHBAR buffer. Only when these are exhausted will the INT\_16 routine allow the application to fetch the final key from the BIOS.

After placing the single key in the BIOS buffer, control returns to the INT\_9 procedure where the SCREEN procedure is

## ■ SLASHBAR is an easy-to-use interface you can add to almost any application program.

called to restore the information on the monitor. The original stack segment and pointer registers (SS and SP) are swapped back and control is relinquished to DOS.

**CONCLUSION** If you've traced through the .ASM listing while reading the latter part of this column, you have, I hope, learned some useful programming techniques. Regardless of your degree of interest in assembly language, however, you can see that SLASHBAR represents a simple, easy-to-use interface that you can add to almost any application program. The interface is programmable and flexible enough to be used by itself as a menu to execute other application programs. In combination with the companion MAKEBAR compiler discussed earlier in PC Lab Notes, it represents a complete programming system that can point the way toward making applications more useful by standardizing their user interface.

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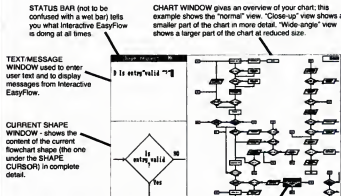
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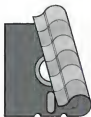
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■ JARED TAYLOR

# SPREADSHEET CLINIC



*Making spreadsheet columns into rows, rows into columns, macros into subroutines, and subroutines into macros; and using wildcards in string searches.*

## USING MACROS AS SUBROUTINES

In 1-2-3, I find there are times when I want to use my standalone macros as subroutines to be called from other macros. I might, for example, have a print macro that I use by itself, but which would be handy to include as a subroutine call from a menu or from a longer macro. Unfortunately it's not possible to call an unmodified standalone macro as a subroutine. The `/xc` command that is used for subroutine calls expects to find an `/xr` at the end of a subroutine, whereas standalone macros end with `/xq` or a blank cell. For similar reasons, you can't use a handy subroutine as a standalone macro either, because it ends with `/xr`. When the macro processor finds an `/xr` without a preceding `/xc`, you get an error.

The routine I call MACEND, shown in Figure 1, tests a one-cell range named MACRO that contains a true-or-false value. This value is true if a macro sequence has been run as a standalone macro and is false if the same routine has been run as a subroutine. Depending on the value of MACRO, MACEND supplies the proper ending to the sequence: `/xq` if the sequence was run as a standalone macro, `/xr` if it was called as a subroutine.

In Figure 1, Alt-T will call two subroutines, both of which are given the proper `/xc` ending. If you want to run the sequences as standalone macros, hit Alt-F or Alt-S. The sequences are simple Page Down and Page Up commands, but could be any useful routine.

What initially sets the value of MACRO is the first line of each sequence when

<code>\T</code>	<code>/xcFIRST"/xcSECOND"/xq</code>	Macro that calls two subroutines.
<code>\F</code>	<code>/dfMACRO"@true---</code>	Sets MACRO to true.
<code>FIRST</code>	<code>{pgdn} /xqMACEND"</code>	First subroutine -- Page Down. Goto MACEND.
<code>\S</code>	<code>/dfMACRO"@true---</code>	Sets MACRO to true.
<code>SECOND</code>	<code>{pgup} /xqMACEND"</code>	Second subroutine -- Page Up. Goto MACEND.
<code>MACEND</code>	<code>/x1MACRO"/dfMACRO"@false---"/xq /xr</code>	Test MACRO: If sequence run as macro, then MACRO=true (1) set MACRO to false (0) quit (/xq) else sequence run by call return (/xr).
<code>MACRO</code>	<code>0</code>	

**Figure 1:** A technique that lets you use the same macro sequences either as subroutines to be called from another macro or as simple standalone macros.

it is called as a standalone macro (`\F` or `\S`). When the sequence is called as a subroutine (`FIRST` or `SECOND`), it is called from the second line, so the value of MACRO remains false.

In order to turn any macro into a useful subroutine, or turn any subroutine into a macro, begin and end the routine with the following lines:

```
/dfMACRO"@true---
sequence . . .
. . . goes
here . . .
/xqMACEND"
```

In combination with the MACEND routine, this structure is all you need. In implementing the technique, however, be sure to give the range names in the first column to the cells to their right. Also, put a value of 0 in the cell named MACRO.

Carl Robinson  
San Clemente, California

This is certainly one solution to the problem, but I would propose another, shown in Figure 2. Just treat every sequence as a subroutine call. When you run `\T`, both sequences will obviously run as they do in Figure 1. If you want to run the routines as standalone macros, first run `\Z`. It pauses for keyboard input at this point; type the name of the subroutine, `FIRST` or `SECOND`, and hit Enter. The sequence will run. Even though you are operating it as if it were a standalone macro, it is in fact be-

<code>\Z</code>	<code>/xcFIRST"/xcSECOND"/xq</code>
<code>FIRST</code>	<code>{pgdn} /xr</code>
<code>SECOND</code>	<code>{pgup} /xr</code>
<code>\S</code>	<code>/xc(?)"</code>

**Figure 2:** An alternate way to use the same sequences as both macros and subroutines.



## ■ SPREADSHEET CLINIC

ing called as a subroutine of macro \Z, so the /x with which it ends will not cause an error message.

The \Z macro technique has additional advantages. By treating every macro as a subroutine call, you can have many more macros than there are letters in the alphabet. Also, you can give each sequence a meaningful name rather than a single letter that may be hard to remember. After you have used \P for the name of your print macro, you can't use the same name (or key) for a macro that calculates profits. If you call the sequences as subroutines of macro \Z, however, you can call them PRIN and PROF, or anything else that's easy to remember.

Mr. Robinson has used Release IA-style /x commands as the basis for his macro, and I have maintained that style. These, as well as the equivalent key words, will work in Release 2.

## TRANSPOSING RANGES

Release 2.0 of 1-2-3 has a /Range Transpose command that turns the columns of a range into rows and vice versa. Although it does manage to accomplish this transposition, any formulas are, in effect, /Copied rather than /Moved. That means that most formulas will no longer refer to the correct cell addresses.

The macro in Figure 3 corrects this problem by /Moving rather than /Copying all the cells in a range. All formulas and functions thus keep their original references. The range you would like to transpose should be named MATRIX. Hit Alt-T, and you can watch the columns and the rows change places. The macro works because 1-2-3 keeps track of the cells in a range in such a way that the range's identity is preserved even if the range changes shape. Thus, once you have transposed MATRIX with Alt-T, if you hit Alt-T again, it will transpose the range once more, and you will be back where you started.

Clearly, you are better off if you design your spreadsheet from the beginning so that the rows and columns are where you want them. But if you change your mind later, this macro will save you a lot of work.

James R. Hays  
Huntsville, Alabama

\Z	[LAT MC,SCOLS[MATRIX]] [LAT MS,ROWS[MATRIX]] [GOTO MATRIX] [FOR K,1,MIN(MC,MS),1,LP] [GOTO MATRIX]	Find the number of columns in matrix and place in MC Find the number of rows in MATRIX and place in MS Place cursor in upper left of MATRIX Loop through the smaller of the number of rows or columns Place cursor in upper left of MATRIX when finished
LP	[FOR J,1,MS-1,LP1] [RIGHT] [IF MS] [FOR K,1,MC-1,1,LP2] [DOWN] [LEFT MC-1] [LAT MC,MC-1] [LAT MS,MS-1]	Loop through the remaining elements in the current column Cursor to the beginning of the next row to be moved Loop through remaining elements in the current row Cursor to the top of the next column to be moved A column has been moved, MC-1 column left to go A row has been moved, MS-1 row left to go
LP1	/M (UP J) [RIGHT J-1-1] [DOWN]	Move from the cursor to calculated location Down the column to the next cell to move
LP2	/N (LEFT I) [DOWN I-1-1] [RIGHT]	Move from the cursor to calculated location Right on the row to the next cell to move
X	7	We move a column & a row, a column & a row until
Z	1	all are moved (X times)
MC	8	Column counter
MS	9	Number of columns
J	6	Row counter
MS	4	Number of rows

Figure 3: A macro that transposes rows and columns in a way that preserves formulas just as the /Move command does.

Other transposition macros I've seen won't work if there are any blank cells in the range being transposed. This macro doesn't care. So long as you have given a block of cells a range name, the macro will go to work on it even if every cell is blank. This well-designed macro could also easily be modified to work with Symphony as well as with 1-2-3.

## SEARCH FOR EMBEDDED STRINGS

The /Data Query Find command in Release 2 of 1-2-3 lets you use wildcard characters (?) and (\*) to search a database. However, you can't use them conveniently to search for an embedded string. If, for example, you wanted to find every record that contained the string Jones, you might be tempted to use \*Jones as your search

criterion. That wouldn't work. The leading \* makes 1-2-3 find every record in the database.

If you thought that the string Jones always appeared as the sixth character in a record, you could use ?????Jones as the search criterion. That way you would pick up Mary Jones, Dean Jones, Phil Jones, Jack Jones, and Paul Jones, but not Alexander Jones. Alexander has too many characters. So, how do you find every occurrence of Jones?

The macro and sample database in Figure 4 show how. The trick is to use a series of wildcard search criteria as in cells D6 through D11. Since 1-2-3 treats criteria in the same column as if they were connected by an #OR# statement, the query finds every record that matches

	C	D	E	F
3	DATABASE	CRIT_RANGE	CRIT_SETUP_RANGE	STRING
4			(Text Format)	
5				Smith
6	NAME	NAME	+*?*%\$STRING%*	
7	John Smith	7\$Smith*	+*?*%\$STRING%*	
8	Mary Jones	7\$Smith*	+*?*%\$STRING%*	
9	Paul Jones	7\$Smith*	+*?*%\$STRING%*	
10	Bob Smith	7\$Smith*	+*?*%\$STRING%*	
11	Jill Jane	7\$Smith*	+*?*%\$STRING%*	
12				
13				
\Z		{recall CRIT_SETUP_RANGE}		Get String
		/CRIT_SETUP_RANGE CRIT_RANGE		Set up the
		/CRIT_RANGE CRIT_RANGE		Criterion Range
		/QIDATABASE CRIT_RANGE		Query
	RANGE NAME TABLE:	CRIT_RANGE	DE..D11	
		CRIT_SETUP_RANGE	DE..E11	
		DATABASE	DE..C11	
		STRING	F6	
		\Z	D15	

Figure 4: Macro for finding an embedded string in a 1-2-3 database.



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labor-Manuf. Process	68,058.03		156,707.08
aterials & Supplies	21,742.98		081.89
Total	248,201.99		241.68

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## ■ SPREADSHEET CLINIC

any of these criteria. To be sure to find every occurrence of Jones, you need to know how many characters deep into the record the most deeply embedded occurrence could be, and keep adding search criteria and ? characters until you are sure you have enough.

The /F macro and the additional range, CRIT\_SETUP\_RANGE, make this technique easier to use. You need only enter the search string, which is named STRING, in cell F6. Then, at the moment when you hit Alt-F, CRIT\_RANGE changes to reflect the new search string, 1-2-3 finds the first matching record, and you are left in FIND mode.

This technique can be valuable when you need to edit long macros. I used to export them to my word processor to search for embedded strings. Now I can run a search *in situ*.

Paul Cotton  
Milwaukee, Wisconsin

*This is a handy addition to /Data Query. CRIT\_SETUP\_RANGE is here shown in text format so you can see the formulas. You might use regular or even hidden for-*

## ■ The /Data Query Find command lets you use wildcard characters to search a database.

*mat in a working spreadsheet. Of course, hiding CRIT\_SETUP\_RANGE means that CRIT\_RANGE will also be hidden after the copy operation in the second line of the macro, and you might prefer to keep your criteria visible.*

*The first line of the macro, which recal-*

*culates CRIT\_SETUP\_RANGE, is not strictly necessary. It simply ensures that the range properly reflects whatever you entered in cell F6. However, the string from F6 gets passed along to CRIT\_RANGE in the copy operation, whether or not CRIT\_SETUP\_RANGE appears to have been updated. What's happening is clearer when CRIT\_SETUP\_RANGE is in general format.*

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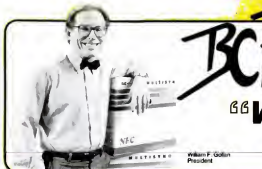
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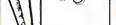
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\*Typical four-PC user system configuration.

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■ FRANK J. DERFLER, JR.

# CONNECTIVITY CLINIC



*Humble pie for LAN-based accounting software, the pitfalls of emulating mainframe and graphics terminals, and a software solution for a sluggish network.*

## REPLACE A MINI?

We have an old IBM System 34 minicomputer that is getting expensive to keep up. IBM would like us to upgrade to a new System 36. The System 34 runs an accounting package using the Job Control Language. We keep five terminals busy all day doing inputs and generating reports. We also have some PCs and ATs used for standalone work. Can we buy more ATs, install a network, and get rid of the minicomputer overhead? Since we are going to do a software conversion either way, is a PC AT-based LAN up to replacing a mini?

*We will probably get a lot of mail on this one, but at this time I believe the answer is no. However, it might be wise to wait before you invest in a new minicomputer. Things are moving fast.*

LAN strategies don't always allow for simultaneous multiple-file access, as it is called in mainframe and minicomputer software. Existing database management programs (which would be the heart of a LAN-based accounting package) are, for the most part, difficult to use for true multiple and simultaneous record access. People skilled in writing a multiple-input networked database application are rare. Because of the quality of the tools currently available, this is a much tougher job on a networked DBMS than on a minicomputer system. Backup is another area in which minicomputers outshine LANs.

However, this gloom will brighten in mid-1987. The new DOS and database management systems will improve the ca-

*pabilities of networked applications and make them easier to use. If you can hang on until the third quarter of 1987, you can start moving your applications onto an adequate networked DBMS.*

OK, now let's hear from all of the companies with a networked accounting package that think they can replace a System 34 today.

## MICRO-TO-MAINFRAME

I want to use my PC to connect to my company's IBM 4381 mainframe. Our technical support people tell me this is difficult because the mainframe is synchronous and the PC is asynchronous. Are they right and what does this mean?

*They are right. The PC normally communicates using asynchronous protocols, and mainframe systems (like your IBM 4381) usually use synchronous transmission.*

Connections between IBM mainframe

systems and terminals have traditionally been done through coaxial cable. Your PC uses a multiwire cable for its communications port.

Also, the screens and keyboards are different. The mainframe sends information to the terminal and expects the terminal to respond and process the information in special ways. These responses and processing capabilities are not part of your PC's normal repertoire.

All of these problems can be overcome by products that have been available for several years. Proven product vendors include CXI of Palo Alto, California; Digital Communications Associates of Alpharetta, Georgia; and Pathway Design of Natick, Massachusetts. These products include an interface card for your PC and software. The card takes care of the synchronous communications conversion and connection to the coaxial cable. The software does the screen presentation. Each PC connects to the communications controller that is between your mainframe and the terminals and convinces the controller that it is an IBM dedicated terminal.

There are several new twists on this method of connecting PCs to mainframe systems that involve the use of networks. IBM announced a new communications controller able to act as a node on either an Ethernet or Token-Ring network. This method of connecting the PC and LAN should be at least as economical as using an interface card—and it will be more efficient.

The other method of connecting networked PCs to a mainframe is to use a

■ The new DOS and database-management systems will improve the capabilities of networked applications and make them easier to use.



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## ■ CONNECTIVITY CLINIC

station on the network as a gateway to the mainframe. Only one connection to the communications controller is needed, and the network stations share it. Digital Communications Associates, CXI, Chi Corp. of Cleveland, and Integrated Network Systems of Mobile, Alabama, market network gateways.

Either of these connection methods is likely to be an efficient way to connect PCs and mainframes. But if you aren't in the market for a new communications controller, then establishing a network gateway is the simplest and least-expensive route.

### EMULATING GRAPHICS TERMINALS

I have a PC and a Tektronix graphics terminal on my desk. Is there a communications program that would allow me to suc-

■ Emulation packages use methods that allow the user to "zoom" in on part of the drawing.

cessfully use the PC to replace the Tektronix? Since the graphics board in the PC supports a much lower resolution, what kind of resolution will I get? How about emulation of the VT-240 terminal running the ReGIS graphics program?

Persoft markets emulation packages that give the PC some of the utility of the VT-240 and Tektronix terminals, and Emu-Tek does a thorough job of imitating a Tektronix graphics terminal. But when a true graphic image is displayed on the PC, you have a choice: only a portion of the image will be visible due to the lower resolution, or the image will be lower in resolution than it would on the Tektronix. Emulation packages use methods that allow the user to "zoom" in on part of the drawing and see it in full detail or pull back to display the entire image in less detail.

The ReGIS command language is more complex than the Tektronix language, so ReGIS images have more parts. The sepa-

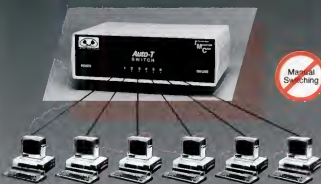
rate parts can be manipulated by the emulation program to fit onto the PC's screen. A ReGIS image is compressed point for point to fit onto the PC's screen without distortion.

The Tektronix language basically draws lines, so the entire image has to be reduced in scale to fit onto the PC's screen. The program takes the 1,024 by 780 resolution on the Tektronix screen and

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scales it to take up the same space on the PC's screen.

Emulation packages have come a long way in a short time, and the EGA does a fair job of displaying all but the most-demanding Tektronix images. (Persoft Inc., Madison, Wis.; (608) 273-6000. Emu-Tek, FTG Data Systems, Stanton, Calif.; (714) 995-3900.)

**TURBOLAN?**

I have two PCs sharing files from an AT server via AST Research's PCnet II. I work primarily on the AT (the server) but when I am forced to use one of the user stations, I find the speed of file saving and loading unbearably slow. Is there any hardware other than a more sophisticated network, perhaps an accelerator board, that will improve the LAN's operation?

Mark Fischer  
Jefferson, Louisiana

The AST PCnet II software is slow. Buying accelerator boards for standard PC workstations could be justified only by the speed improvement you get when you run applications. You would get only a marginal improvement in LAN performance. Running the AT as both a local workstation and a file server is a heavy load for the AT's processor. My advice is to scrap the AST networking software associated with the PCnet II, keep the AST PCnet II cards, and buy Novell's Advanced NetWare/286. When you install NetWare, select the option for the PCnet II (Santa Clara, Orchid, or AST are all the same). You can configure the server either to be dedicated or to include a DOS partition. Advanced NetWare is expensive, but the increase in network performance will be significant.

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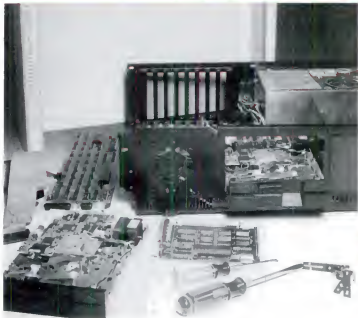
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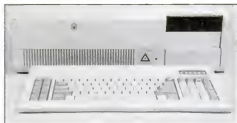


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■ EDITED BY CRAIG L. STARK

# POWER USER



*WordPerfect tips on letter formats and using endnote numbering, a speedier dBASE LTRIM routine, debugging modem command sets and Word mail-merge procedures.*

## MORE ON LETTER FORMATS

In your December 23, 1986, issue (Volume 5 Number 22), M. David Stone argues that storing standard letter formats as files rather than as macros makes them easier to edit.

With *WordPerfect*, however, macros have an advantage. If you set up a letter format by retrieving a format file, *WordPerfect* will save the completed letter under the name of the format file as a default. If you neglect to change the filename, you make a mess of your format file and risk misplacing your completed letter.

Using macros to set up standard formats, however, forces you to specify the document name before you save the file, possibly saving you much frustration. Furthermore, since *WordPerfect* provides an excellent macro editor, "power users" can easily modify macros.

Bob Clark, Jr.  
San Jose, California

*I side with M. David Stone on the "ease of editing" issue. Even if you purchased WordPerfect Library, which includes WordPerfect's macro editor, editing a document is easier for most than editing a macro.*

*As for forgetting to change the document name when retrieving standard letter format files, there are several ways to get around that problem. The simplest safeguard is to add a message to the bottom of every format file that reminds you to change the default name when you save the file.*

*A more elegant, and foolproof, strategy*

*is to create a simple macro, such as the one below, to manage the retrieval process for you and automatically name the new file.*

```
Ctrl-F10 FORMATS<CR>
Shift-F8 1 F7
F10
Ctrl-PgUp <CR> dummy.1 <CR><CR>
F5 c:\pathname
Ctrl-F10
```

*The first line begins by defining the macro FORMATS. The second line inserts a do-nothing code into the current document so you can save it. The third line invokes Save.*

*The fourth line takes advantage of WordPerfect's pause feature to allow you to enter a filename for your document when you run the macro. You must specify a dummy filename—I used DUMMY.1—when you create the macro.*

*The fifth line calls up the List Files screen for the directory that holds your*

*standard letter formats (I'm assuming you store your format files in a separate directory). The last line ends the macro definition.*

*When you run the macro you'll be prompted for the filename of the new document. After entering the name, you will be able to choose one of your standard letter formats from the List Files screen. The open document is then in the correct format, and the document name is the name you specified.—Mitt Jones*

## RENUMBERING IN WORDPERFECT

I work with survey questionnaires that often need questions removed or reordered. Renumbering a 200-plus item questionnaire is tedious to say the least, but I've discovered a trick using *WordPerfect*, Version 4.1, that makes it unnecessary to renumber manually. I suspect something similar could be done with any word processor that allows endnotes and automatically rennumbers them.

With *WordPerfect*, I insert an endnote code wherever I need a number. In other words, I create an endnote with no text. Then, no matter how I reorganize a questionnaire, the items are automatically renumbered correctly. The endnote marker is added with Ctrl-F7, then 5, but by using a macro you can reduce the process to a single keystroke. *WordPerfect* also lets you define the endnote as a standard number rather than a superscripted number (see page SF-12 in the manual, or experiment with the Options choice after Ctrl-F7).

When using this trick, be sure to put a hard page code at the end. The one prob-

■ Even if you purchased *WordPerfect Library* and its macro editor, editing a document is easier for most than editing a macro.



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### ■ POWER USER

lem is that several pages of numbers (endnotes with nothing in them) are printed out at the end of any such document, and you don't want them to start appearing on the last page of your questionnaire.

Michael Shapiro  
Madison, Wisconsin

Actually, there is an easier way to number a list of questions in WordPerfect. Choose **Alt-F5** for mark text, then 2 for paragraph, then 3 for level. (As Mr. Shapiro points out, you can reduce the chore to a single keystroke by using a macro.) WordPerfect will now automatically number and renumber your questions as needed.

Mr. Shapiro's ingenuity is not wasted, however. There are many word processors that do not provide for paragraph numbering but do provide automatic numbering for endnotes or for section titles. WordStar Professional, for example, includes a table of contents generator that also numbers the section titles within the document. Most programs with these features will let you define the numbering scheme to use, so you can trick them into numbering paragraphs for you.

If you don't have automatic numbering features in your word processor, turn to your outliner if you have one. Most of these programs will similarly let you define the numbering scheme, and they all renumber automatically.—M. David Stone

### FASTER dBASE LTRIM

Mr. Daniel Lentz's program (Volume 5 Number 20) to simulate the new LTRIM( ) function in dBASE III Plus is good. But the process can be speeded up by putting the necessary code into just three lines.

Assuming that "string" is the variable you're trying to left-trim, the code in dBASE III, Version 1, would be

```
DO WHILE SUBS(string,1)=" "  
  string=SUBS(string,2)  
ENDDO
```

In dBASE II, just substitute \$ for SUBS on line 1 and STOR \$(string,2) to string.  
Vincent Alfieri, Ph.D.  
Los Angeles, California

Thank you, this code is faster. To incorporate it into Mr. Lentz's full routine (which REPLACES the actual data), first STOR

field name TO string, then run Dr. Alfieri's three-line loop; finally, REPLACE field name WITH string.

If your database has some blank fields, the loop will run faster if it first checks that there's something to process; if the field is empty, the DO WHILE loop will plow through every byte before SKIPPING ahead to the next record. To add this check, just add

```
.AND. LEN( TRIM( string ) ) > 0
```

to the DO WHILE line.—Brad Stark

### SIDEKICK INDEX CARDS

SideKick's Calendar/Appointment utility can make a great index card file system. Simply use the "Title" line for the card heading and treat each day as an index card. SideKick provides 198 years times about 365 days—well over 72,000 index cards. You can maintain the index cards and appointment diary in separate files by creating a separate index card file, using the Name command (F2) from the appointment display.

To keep track of your data, designate an index year, such as 2000, to maintain a list of what information is in which year.

■ **SideKick's Calendar/**  
**Appointment utility can**  
**make a great index card**  
**file system. Simply**  
**treat each day**  
**as an index card.**

month, or day. You can also search through your cards manually by scrolling through the days from the appointment display.

Name and address withheld

The hard part in implementing this tip is finding your data quickly, since there is no way to search for keywords. It would be worth taking the time to design a data file structure. For example, you might assign



one decade for each project, the first year of each project for notes on phone conversations, and then use one month for each person you call. Within that month, each day can be used for notes on a single phone call.—M. David Stone

#### DEBUGGING WORD MAIL-MERGE

While Microsoft Word can use up a lot of paper in testing a mail-merge procedure (see "Power Performance: Nine Program-

■ While Microsoft Word can use up a lot of paper testing mail-merge, it has the tools to make such waste unnecessary.

mable Mail-Mergers," Volume 5 Number 8), it contains the tools to make such waste unnecessary.

To simplify the procedure, always use a separate header file for the field descriptions. The format for instructing the merge letter where to find the header and data is

"DATA HEADER.DOC, DATAFILE.DOC"

Split your screen into two windows, putting the data file in one and your merge letter in the other. Highlight the first record in the data file, and copy it to the glossary name "TEST". (If you have a lot of conditionals in your merge letter, highlight and copy the most complex data record.)

Highlight the entire file and delete it to the glossary name "DATAFILE." When you type "TEST" and hit F3, your selected record will appear. Transfer over to the merge document window and debug your letter, safe in the knowledge that each time you now Print Merge, only one letter will print.

When you're satisfied with the result, return to the data window, delete the test record, type "DATAFILE", and press F3. Your entire data file will reappear. Return to the merge document window, Print Merge, and you're done.

One other tip: As your article on mail-merge programs stated, Word's print spooler will not work with Merge, but external spoolers will. To compute the size for the spooler, multiply the bytes in your merge document by the number of records in your data file.

Jim Lewis

Wilbraham, Massachusetts

This is an efficient way to debug Word mail-merge files. If you have a complex merge letter filled with conditionals, however, you should probably go through the debugging steps with several carefully selected records rather than just one. That way you can test each of the conditional branchings.—M. David Stone

#### LOGGING SYSTEM USE

The Norton Utilities' TIMEMARK (or TM) program provides a simple way for hard disk users to create a system log for test purposes or their own information.

The TM output format is

10:24 am, Friday, September 12, 1986

The following batch file combines that output with the name of the program being run and the name of the user and puts the information in the file SYS.LOG in the subdirectory LOG:

```
echo off
if "%2" == "" goto :err
echo %1 used %2 >> c:\log\sys.log
tm >> c:\log\sys.log
command /c %2 %3 %4
tm >> c:\log\sys.log
goto :endd
:err
echo must specify user name.
echo AND
echo program name.
echo
echo SYNTAX:
echo run {username} {program}
:endd
```

Now each time you want to use a program simply type

```
run {username} {program}
```

and your log will be created automatically.

Adam B. Landau

New York, New York

Be aware that each line produced by TM ends with a line feed through a carriage return, so that if you TYPE it to the screen or

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to a printer, the second time notation for each entry will overprint the first. To print the log, load it into a word processor and do some preliminary editing. In most cases, you'll have to search for the line feeds and replace them with line feed/carriage returns, though some word processors (WordPerfect, for one) prefer the line feed by itself.—M. David Stone

### SIDEKICK PATCHING

*SideKick* allows the user to specify several different modem command sets, but my Cermetek modem's set is not among them. Thanks to DEBUG, however, I've been able to regain the use of *SideKick*'s autodialer. The approach I used should be applicable to other command sets not supported by *SideKick* and should also work for other programs that send commands to your modem.

Start with DEBUG and a copy of SK.COM and type

```
DEBUG SK.COM
```

Now type

```
s 0000 FFFF =ATD=
```

S is the DEBUG search command. This line tells DEBUG to look through the full range of memory addresses for the string ATD. The S and FFFF can be upper- or lowercase, but be sure to use uppercase for

■ **TIMEMARK** provides a simple way for hard disk users to create a system log for tax purposes or their own information.

the ATD, since that is the exact string you are looking for.

If DEBUG finds a match (and it should), it will then return the address for the ATD string. This response will take the form xxxx:yyyy, where yyyy is the number you are interested in. In my copy of SK.COM (Version 1.56A), the address is xxxx:88EA, but different versions

will show different addresses.

Now that you know the address, use the Dump command to look at the information at this location. Type

```
d 88EA
```

(or whatever your system turned up for yyyy). This should show you a hex string with the ASCII interpretation

```
ATD .$$$$$$$$$ :
```

The A is at memory location 88EA (or whatever).

The next step is to change the ATD to the appropriate command for your modem. In my case, Ctrl-N is the correct sequence (but you'll need to substitute the control sequence appropriate to your modem). To make the changes, use the DEBUG edit command

```
e 88EA
```

(or yyyy). DEBUG responds with 41, the hex code for A. Type 0E for Ctrl-N, then a space to move to the next memory location. DEBUG responds with 54, the hex code for T. There, type 44, for D, then a space. DEBUG responds with 44, which is ASCII D. Type 20, replacing the D with a space, then type a space to move to the next location. DEBUG responds with 20 (space). Type 27 (apostrophe), then type 12 spaces, to move to the semicolon (3B). Then replace the semicolon with an apostrophe (27). (All of these hex codes are in the *SideKick* ASCII table, of course. You can use the unpatched version of SK.COM to help you patch the program.)

*SideKick* also has to know how to hang up the phone. It happens that the ATH command shows up on the same screen dump as the ATD command, so you don't have to run a second search. After you've replaced the semicolon with the apostrophe, 15 spaces take you to the A of the ATH command. Then replace the ATH with "Ctrl-NE" (or your modem's equivalent command). With the changes finished, write them to disk and quit DEBUG by typing

```
w  
q
```

being sure to hit Return after each line.

All that remains now is to configure the modified version of *SideKick* to use what it

thinks is a Hayes command set that you have modified for your own use. Then reboot your PC in order to load the new version of *SideKick* and test the autodialer with your "oddball" modem.

Greg Schulte  
Springfield, Virginia

*Regular readers of Power User will recognize this search-and-replace routine as similar to the one whipped up by Charles Petzold and described by Craig Stark in*

■ *SideKick* allows you to specify several modem command sets, but not my Cermetek's. With DEBUG I've regained use of *SideKick*'s autodialer.

*Volume 5 Number 9 in connection with XyWrite II and DOS 3.x. The goal then was to circumvent a change in DOS so that XyWrite II could find COMMAND.COM in the root directory. The goal here is to change the modem commands. However, the underlying trick is the same, and the general lesson is the most valuable.*

*Incidentally, you do not need to reboot your PC in order to load the new version of SideKick. It's much easier to call up the SideKick menu, then use the hidden (but documented) SideKick command of Ctrl-Home Ctrl-End to wipe the program from memory. You can then reload it from scratch.—M. David Stone*

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■ PAUL SOMERSON

# USER-TO-USER



*Streamline directory comparisons, manage your hard disk, and have your system automatically execute anything at a time you specify.*

## COMPARING DIRECTORIES

I frequently want to compare the contents of two disks or a disk with a subdirectory to see which files are in one and not in the other, so I wrote the UNIQ.BAT batch file in Figure 1 to do just that. To make things friendly, if you enter UNIQ typed with no parameters, the batch file gives you instructions on its use.

Note that this works with DOS 3.x. DOS 2.1 does not find files correctly.

The same principle can be used to create a batch file that will copy files from a disk to a subdirectory (or vice versa) if the filename does not already exist on the destination. The NC.BAT batch file (for New Copy) in Figure 2 accepts wildcards to let you copy selected sets of files.

Again, if you try to use it without parameters, the batch file will print a helpful message.

Ted Shapin  
Orange, California

*If you would like to log the list of files reported by UNIQ.BAT to disk rather than just displaying it on the screen, simply create a small file called LOG.BAT containing the one line*

```
command /c uniq %1 %2 >logfile
```

*As Mr. Shapin suggests, his batch files won't work properly with older versions of DOS, since DOS 2.0 and 2.1 can't support IF EXIST searches through PATHs. This (along with DOS 3.2's terrific XCOPY utility) is yet another good reason to upgrade.*

```
echo off
if %1==q goto help
if %2==q goto help
echo Files on %1 but not on %2
for %%a in (%1*.*) do if not exist %2%%a echo %%a
echo Files on %2 but not on %1
for %%a in (%2*.*) do if not exist %1%%a echo %%a
goto end
:help
echo UNIQ lists files that are not on both disks
echo Usage: UNIQ a: c: where c: is the default drive
:end
```

**Figure 1:** UNIQ.BAT batch file that compares the contents of two disks or a disk with a subdirectory to see which files are in one and not in the other. This procedure works only with DOS Versions 3.0 or later.

```
echo off
if %1==q goto help
if %2==q goto help
echo Copying files from %1 that are not already on %2
ctty nul
for %%a in (%1) do if not exist %2%%a copy %%a %2
ctty con
goto end
:help
echo NC copies files from a source disk or directory to a
echo destination if they're NOT already on the destination.
echo Usage: NC *.* c:
echo          NC *.DOC \subdir
echo You must be in the directory you want to copy from.
:end
```

**Figure 2:** NC.BAT lets you copy selected sets of files.

## OUTLINING YOUR HARD DISK

If your hard disk is so full of directories, files, and programs that you can't remember what they're all for, you can tame it easily with a memory-resident outline processor, such as Living Videotext's *Ready!* or Brown Bag Software's *Outline!*.

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file directories. You can create an outline that exactly matches your directory structure. And you can insert additional outline levels to develop an even more useful organizational structure and help you keep track of things.

I have one outline for my entire hard disk. I can open up any outline entry to get a list of subdirectories, programs, or files.



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## ■ USER-TO-USER

Each of these items has a brief descriptive phrase associated with it (a feature the DOS DIR command sadly lacks), and each item is itself an outline entry that can be opened up into another outline level.

Since the outliner is memory resident, this information is available for access or update whenever you need it. And since these outline processors make importing text from other programs very easy, you don't even have to key in all this data. My program, file, and directory lists, for example, were imported straight from DOS's DIR listing. I just organized them into my outline and entered the descriptive phrases.

If, like me, you've collected a lot of handy, miscellaneous programs, each explained in a little READ.ME or .DOC file, you can import these explanations into your outline and get rid of the files, thereby providing on-line help for any program that may lack it.

In addition, you don't have to document your entire hard disk and each file in it all at once. File types, such as font files or backup files, can be documented with a single \*.FNT or \*.BAK outline entry.

Chris Shaw  
Manhattan Beach, California

Some users swear by outliners, and it's true that the hierarchical DOS directory structure lends itself to organization by outline. What's especially interesting is that an outliner will let you see your main directory structure, the subdirectories that spin off the main entries, and all the files within these subdirectories, at the touch of a key.

If you use Borland's SideKick—and just about every power user we have met does—you can adapt Charlie Petzold's terrific VTREE utility to give you some of this memory-resident hard disk management, but not the instant ability to switch between displaying your main subdirectories and a list of the files in one of them.

(In case you've never used it, VTREE will display a pictorial representation of your hard disk's tree structure. It's on our PC Magazine Utilities disk, or you may download it from our IRS bulletin board, (212) 696-0360, no parity, 8 data bits, 1 stop bit.)

Simply redirect the output of Petzold's

VTREE utility into a file called NOTES, using the command

VTREE > NOTES

and then put the NOTES file in your main SideKick directory.

When you summon SideKick's notepad, it automatically loads a file called NOTES (or you can use the SETUP command to change the name and path of this default file). Once you've redirected the output of VTREE, SideKick will automatically display a picture of your subdirectory tree each time you bring up the notepad. The first time you pop it up, be sure to hit Ctrl-QG to toggle on the high-bit characters used to draw the tree structure.

You can use SideKick's notepad to add comments and descriptions to the NOTES file if you want. Or, since SideKick's SETUP command will let you install a name with a wildcard in it, you can create several different hard disk management files, with HD extensions. Tell SETUP to have SideKick load \*.HD files, and when you pop up the notepad you'll be able to choose which file you want to examine from the menu provided. If you have three subdirectories, \DOS, \UTILITY, and \DATA, use DOS's redirection abilities to create three files called DOS.HD, UTILITY.HD, and DATA.HD.

For instance, if you keep your miscellaneous utilities in your \UTILITY subdirectory, type

DIR \UTILITY > UTILITY.HD

You may want to clean up the listing a bit by sorting the directory listing and removing the extraneous DOS information with a command like

DIR | SORT | FIND " " | FIND /V " " > UTILITY.HD

FIND " " will eliminate everything without a creation date, and the FIND /V "<" will get rid of subdirectory entries that clutter up your listing.

Then you can use the notepad to add comments describing what's in the various files.

### WAITING FOR DOS

While it's possible to purchase commercial programs that can execute a process at a certain time of day, I've managed to ac-



comply this using a batch file and DEBUG. This is not the most efficient way to do it (an assembly language program would do it best; a BASIC language program could also do it), but it works.

The batch file WAIT.BAT in Figure 3 takes care of this for you. You invoke it by typing WAIT with a time parameter (in 24-hour format). For instance, to make it wait until 1:15 A.M., type WAIT 1:15.

If the user doesn't enter any parameters from the command line, execution jumps to the :PROCESS section. This happens later in the file when WAIT.BAT is called from TEMP.BAT.

The :SETUP section runs only the first time the user types in WAIT HH:MM (e.g., WAIT 1:02). The specified time that it looks for is placed into the environment under the variable UNTIL. The batch file then removes the variable TIME from the ENVIRONMENT if it already exists.

After clearing the screen, the lines that

begin with ECHO create and append instructions to a file called TEMP. This TEMP file is later redirected into DEBUG.

The :PROCESS section prints the cur-

```

ECHO OFF
IF "%1"==" " GOTO PROCESS
:SETUP
SET UNTIL=%1
SET TIME=
CLS
ECHO E 188                                >TEMP
ECHO 53 45 54 28 54 49 40 45 30 >>TEMP
ECHO M 118 114 189                      >>TEMP
ECHO E 188                                >>TEMP
ECHO 8D 8A 57 41 49 54 8D 8A 1A >>TEMP
ECHO M                                    >>TEMP
ECHO Q                                    >>TEMP
:PROCESS
IF NOT "%TIME%"==" " ECHO The time is: %TIME% Waiting till: %UNTIL%
IF %UNTIL%==%TIME% GOTO DONE
ECHO %TIME% >TEMP.BAT
OBSCU TEMP.BAT <TEMP %NUL
TEMP
:DONE
CLS
DEL TEMP.SAT
DEL TEMP
ECHO Ready to run the task...
REM Command for running the task should go here...

```

**Figure 3:** *WAIT.BAT* batch file that executes a process at a time you specify.

[illegible]



## ■ USER-TO-USER

```

10 ' WAITTILL.BAS
20 KEY OFF:SCREEN 0:COLOR 7,1:CLS
30 PRINT "Current time is: ";LEFT$(TIME$,5)
40 PRINT "Enter the time to execute command ";
50 INPUT "(in HH-MM 24-hour format): "T$
60 IF INSTR(T$,";")=2 THEN T$="0"+T$
70 LOCATE 2,1:PRINT "Now waiting for: ";T$;"00";SPC(60)
80 WHILE T$<>LEFT$(TIME$,5):LOCATE 1,10:PRINT TIME$:WEND

```

**Figure 4:** WAITTILL.BAS program to wait for a specified time. To use this program, follow line 80 with a SHELL instruction to execute a DOS command, or add a line 90 SYSTEM and run this out of a batch file where the first line of the batch file is BASICA WAITTILL and the next line executes the desired command.

```

10 ' WAITTIL2.BAS
20 KEY OFF:SCREEN 0:COLOR 7,1:CLS
30 PRINT "Current time is: ";LEFT$(TIME$,5)
40 A=1:WHILE ENVIRON$(A)<>" "
50 IF LEFT$(ENVIRON$(A),4)="TIM=" THEN T$=ENVIRON$(A)+1
60 WEND:PRINT "TIME ENTERED INCORRECTLY":END
70 T$=ENVIRON$(A):IF INSTR(T$,";")=2 THEN T$="0"+T$
80 LOCATE 2,1:PRINT "Now waiting for: ";T$;"00";SPC(60)
90 WHILE T$<>LEFT$(TIME$,5):LOCATE 1,10:PRINT TIME$:WEND
100 SYSTEM

```

**Figure 5:** WAITTIL2.BAS program that reads the time out of the DOS environment. Run this from the TIMER.BAT batch file described in the text.

not, it puts the current time into a TEMP.BAT file. The "ECHO" portion is piped into the TIME command to provide a carriage return to the prompt "Enter new time:". When the file TEMP.BAT is initially created, it looks something like this:

```

Current time is 13:02:44.60
Enter new time:

```

By redirecting the TEMP file it just created into DEBUG, it edits TEMP.BAT:

```

SET TIME=13:02
WAIT

```

Finally, the batch file runs the TEMP.BAT batch file that it just created. This TEMP.BAT file sets the ENVIRONMENT variable TIME to the current hour and minute and then reruns WAIT.BAT.

The last section :DONE runs only when the desired time is reached. This part of the batch file deletes the temporary batch file TEMP.BAT and the temporary instruction

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## PRODUCTIVITY

### ■ USER-TO-USER

file TEMP, and then executes the process you wanted to run at the specified time.

To reduce disk accesses, run this batch file and DEBUG.COM from a RAMdisk.

Melvin T. Johnson  
Saskatoon, Saskatchewan  
Canada

*Using DEBUG this way is a triumph of brute force. This will do the job, although if you try it, take Mr. Johnson's advice seriously about running it off a RAMdisk.*

Another way to do this was explained recently by Charlie Petzold, who created a batch file similar to the WAITTIL.BAS one in Figure 4. To use this, follow line 80 with a SHELL command that executes whatever it is that you were waiting for, or add a line 90 SYSTEM and run this out of a batch file where the first line of the batch file is BASICA WAITTIL and the next line executes the desired command.

Or, if you're using BASICA 3.x, you could get a little tricky and have it read a value out of the ENVIRONMENT using ENVIRON\$. Create a batch file called TIMER.BAT:

```
ECHO OFF
IF %1==1 GOTO OOFS
SET TIM=%1
BASICA WAITTIL2
REM DOS COMMAND GOES HERE
GOTO END
:OOFS
ECHO YOU DIDN'T ENTER A TIME
ECHO IN HH:MM 24-HOUR FORMAT
:END
```

To run this, make sure TIMER.BAT and WAITTIL2.BAS (shown in Figure 5) are on your disk (and that you're using a current version of BASIC), and type

TIMER 3:30

(or whatever 24-hour format time you want in place of the 3:30). And substitute your own DOS command for the dummy REM line in TIMER.BAT.

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■ CHARLES PETZOLD

# PC TUTOR



*What to do if you don't want to redo from start; handling programs that can't handle subdirectories; triggering turbo modes; Proprinter reset problems; AT vs. turbo XT.*

## REDO FROM START

I've been programming in BASIC on an IBM PC and I'm having a problem with the "?Redo from start" message that INPUT displays when somebody inputs the wrong information. Several programs that I've written are adversely affected by this automatic error message. Is there a way to solve this problem?

William J. Stockell  
Hartford, Connecticut

*This problem represents one of the most common dilemmas in programming. Programming involves making decisions, and one of these decisions concerns the use of "high-level" or "low-level" facilities in the language.*

You can either use a very high-level part of the language (like the INPUT statement) and grudgingly accept everything about it, or you can roll your own and write your own customized keyboard input routines that do exactly what you want them to do. You're not the only person who doesn't care for everything about the INPUT statement. I get a surprising number of letters about it. In another recent letter, a BASIC programmer wanted to prevent the user from backspacing during INPUT.

The INPUT statement has to accept a series of typed characters, convert them to either strings or numbers, and then store the results in one or more variables. If it can't do that, it just gives up on the whole thing and asks for all new input.

Your alternative is to write something to replace INPUT. One relatively easy method might be to use INPUT\$ to simply

*read a character string, then search for commas in this string to separate the various fields, and use VAL to convert any numeric fields to numbers. You would also have to decide how you wanted to deal with the inevitable input errors. I hope your solution will be more graceful than "?Redo from start."*

You can go to much lower levels than this. You can read in keyboard input on a key-by-key basis with the INKEY\$ command, which doesn't even echo the characters to the screen. You can test the validity of each character before you decide to accept it and only then PRINT it to the screen. You can also write your own routines for converting inputted numeric strings to numbers, if you want.

INPUT is doing all of this for you. The price you pay is accepting everything else it does. Once you start trying to handle input errors on your own, you'll find it to be one of the most difficult areas of program-

*ming. Programming would be easy if every keyboard entry and data file was perfect. The "?Redo from start" approach that BASIC takes is certainly the simplest form of error handling. If you want something more sophisticated than that, well, it's up to you.*

## SUBDIRECTORY WOES

I've recently upgraded to a hard disk, but I now find that I can't take advantage of the subdirectories for my WordStar data files. With WordStar occupying a subdirectory, my data files must be in that same subdirectory or on one of the floppies.

How have other WordStar users solved this problem?

Bill Lockie  
Clovis, California

*This is a problem confronting not only WordStar users, but users of other programs that can recognize different disk drives but not different subdirectories. Although I'll use WordStar as an example, most of what follows will apply to these other programs as well.*

Some WordStar users have solved the problem by putting a copy of WS.COM and its overlay files (WSOVLY1.OVR and WSMGS.OVR) in each of the subdirectories where they have WordStar data files. For obvious reasons, this is the worst way of solving the problem.

A better solution is to use a RAMdisk. A RAMdisk is a program that uses an allocated area of memory to simulate a fast disk drive. DOS 3.0 or later includes a RAMdisk program called VDISK.SYS for

■ Once you start trying to handle input errors on your own, you'll find it to be one of the most difficult areas of programming.



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### ■ PC TUTOR

this purpose, and many memory boards also include their own RAMdisk software. If you have an expanded memory board, putting the RAMdisk in expanded memory takes up very little space in conventional memory.

For systems with one or two floppy disk drives and one hard disk, a RAMdisk will be drive D:. Assuming your WordStar files are in a subdirectory called WordStar, you would include the following lines in your AUTOEXEC.BAT file:

```
COPY C:\WordStar\WS.COM D:
COPY C:\WordStar\WS*.OVR D:
```

These two commands copy WordStar to the RAMdisk every time you boot up. Now WordStar is on drive D: and your data files are on drive C:. Then, to use WordStar within a particular subdirectory, change to that subdirectory using the CHDIR or CD command, switch to drive D:, load WordStar with WS, and then change the logged disk drive back to C: within WordStar, using the L command on the main menu.

You can eliminate some of these steps by changing WordStar's "System Disk Drive." This is the disk drive where WordStar searches for its overlay files if it can't find them on the current drive. Run WINSTALL, pick "Other WordStar Features," and change the "System Disk Drive" to drive D:.

Now, to load WordStar, you need only use CD to change to the subdirectory on your hard disk that contains your data files and then execute

D:WS

Indeed, if you include D: \ in your PATH command in your AUTOEXEC.BAT file, you can run WordStar with just

WS

You'll notice an improvement in WordStar's performance as well, since it is reading in the overlay files from memory rather than a physical disk.

Beginning with DOS 3.1, you have another, simpler alternative that does not require setting up a RAMdisk. This approach involves using the SUBST (Substitute) command. SUBST creates a drive letter that, in fact, refers to the path for a subdirectory. Your AUTOEXEC-

.BAT file would contain the command

```
SUBST D: C:\WORDSTAR
```

After this command is executed, drive D: is a new disk drive that is the subdirectory containing the WordStar files. For instance, if you execute

```
DIR D:
```

you'll see the contents of the WordStar subdirectory.

If you have used WINSTALL to change the WordStar "System Disk Drive" to D: and have included D: \ in your PATH command, you're set. To use WordStar in any subdirectory, change to that subdirectory and execute WS.

### AT OR TURBO XT?

I'm trying to decide whether to go with an 80286 machine or an 8088 with two clock speeds—one normal and one turbo. In practical terms, just what does an 80286 microprocessor do that the 8088 doesn't? There is an obvious price difference, and I'm not sure if my intended usage warrants the more expensive 80286 AT, even if I stick with buying a lower-priced clone.

Steve Figard  
North Chicago, Illinois

There are several things to consider here.

Processor speed: It's not just the clock. The 80286 executes many instructions faster than an 8088, particularly the very complex instructions such as multiplication and division. The 80286 also accesses memory in 16-bit words instead of 8-bit bytes. For a reasonable instruction mix, the processor speed of an 8-MHz PC AT is about 3½ times as fast as a 4.77-MHz PC or XT. Less than half of that differential is due to the clock speed. So, even an 8- or 10-MHz 8088 will still run much slower than an 8-MHz 80286.

Disk speed: If you're buying a clone, you have to watch out for this. The hard disk on IBM's AT is rated at a 40-millisecond average seek time. (This is the time required for the hard disk head to move to a particular track.) Commonly, IBM ATs clock in at around 30 milliseconds. The hard disk on IBM's XT is rated at 85 msec. and is often a little slower than that.

So, part of what constitutes an AT-class machine is the faster hard disk speed. But



buying an "80286 machine" doesn't necessarily mean that you get a faster hard disk. IBM's infamous "XT 286," for instance, has an 80286 microprocessor but comes with a slow XT-type hard disk. The best way to get comparisons of disk speed between machines is to study the benchmark-test results PC Magazine publishes in its reviews. Stock IBM machines are usually the basis of comparison.

The future: You may have heard or read something about the new version of DOS expected from Microsoft sometime this year. This new DOS (at times called "DOS 5" or "Protected Mode DOS" or "286 DOS" or "Advanced DOS") will take advantage of the "protected mode" of the 80286 microprocessor. It will break

■ Once the new DOS is released, there is going to be a lot of industry focus on it. If you don't have an AT compatible, you may feel left out of things.

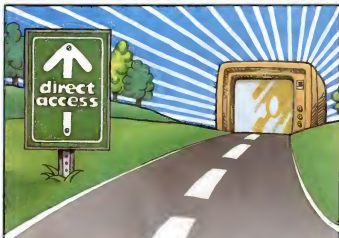
the 640K memory limit and allow programs access to 16 megabytes of memory. It will support efficient and safe multitasking, as opposed to the inefficient and unstable multitasking that some programs attempt to implement on the PC today. In short, it promises to be a grown-up operating system for the AT, something that will inspire a whole new generation of advanced software.

Obviously, it will take some time for applications to appear that use this new DOS. And even more obviously, nobody is going to take away all the great software that currently runs under the DOS 2.x/3.x environment on PCs and XT's. But once this new DOS is released, there is going to be a lot of industry focus on it because it marks the future of the PC.

This new DOS will run only on ATs and

AT compatibles. If you don't have an AT compatible when this new DOS comes out and everything starts cooking, you may feel left out of things. You may feel as I did when I bought a CP/M machine (the Os-

borne) soon after the first PCs came out. Some very fine software for CP/M was available, but the focus shifted to the PC, and that's where all the hot new software appeared.



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## ■ PC TUTOR

### SWITCHING TO TURBO MODES

When my PC-XT died recently, I took it to the dealer, where it was diagnosed as having a bad motherboard. Since the cost of an IBM replacement of this part exceeded the cost of a complete clone, I decided to replace the motherboard with a "turbo motherboard" for about one-eighth the cost of the standard-speed IBM board.

I'm very happy with it. The turbo mode (which uses an 8-MHz clock speed) is initiated by a Ctrl-Alt-Plus key combination. But it's annoying to have to key this manually each time I boot up.

Is there a small program I can put in my AUTOEXEC.BAT file to put the machine into turbo mode automatically?

Lt. Ray P. Stallings  
 San Francisco, California

*Probably. It's most likely a very short, simple program that just manipulates an output port to switch to the different clock speed. The code is probably right in your motherboard's ROM BIOS. Duplicating it in a small .COM program created in DEBUG is no doubt a trivial task.*

*The hard part is finding where that code is located in the ROM BIOS and exactly what it does. This requires using DEBUG to disassemble the portion of the ROM BIOS that does the processing of interrupt 9, which is the hardware keyboard interrupt. Look for a place in the code where it checks if the scan code is a 0Dh (if you use the Plus key at the top of the keyboard) or a 4Eh (if you use the number-pad Plus key), and checks that the Ctrl and Alt keys are depressed, which means that bits 2 and 3 in the byte at 0040:0017 are set. At that point it should call a small routine or perform the output port manipulation directly.*

*If this does not sound like an appealing job, it's not. But for something like this, it's not possible simply to write a program that mimics a Ctrl-Alt-Plus key combination. That key combination can be generated only by the hardware of the keyboard, not by software.*

*If your new motherboard did not come with documentation that describes what must be done to switch to the turbo mode, and if the manufacturer can't give it to you and you can't find somebody else who has already solved the problem, then there's*

*nothing you can do except track down the code in the ROM BIOS and duplicate it in a small program.*

*There are advantages and disadvantages to buying IBM equipment and buying clone equipment. The clones certainly have the advantage on price and often have features that IBM can't match. But few clones offer the same level of technical documentation available for the IBM machines. If IBM ever provided a keyboard-activated turbo mode, the method to switch to the turbo mode would be documented in its Technical Reference manuals. Even if it were not, it could be located in the published listings of the ROM BIOS.*

### SET PRINTER DEFAULTS

Epson printers can be reset to "power-up state" by sending ESC @. I am unable to find an equivalent command sequence for resetting the IBM Proprinter. Is there one?

Robert E. Brown  
 Plaistow, New Hampshire

*No. This is a real problem for programmers of word processing software, particularly for those whose programs have very sophisticated printer control commands for formatting.*

*One way to reset printers to a default state is by using the BIOS interrupt 17h call with AH equal to 1. This is a hardware reset that DOS sends out to the printer when booting up and that the old BASIC compiler used to add to every compiled BASIC program. Often the printer audibly responds to this reset. If you have a print buffer installed, however, the print buffer is probably intercepting this reset call and ignoring it, because letting it go out to the printer in the middle of printing something would be a problem.*

*A better way to reset the printer to default values is simply to output all the control sequences to turn off special features, set the default line spacing and character spacing, and so forth. It's a mess, but that's the way it's done.*

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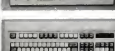
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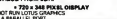
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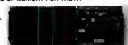
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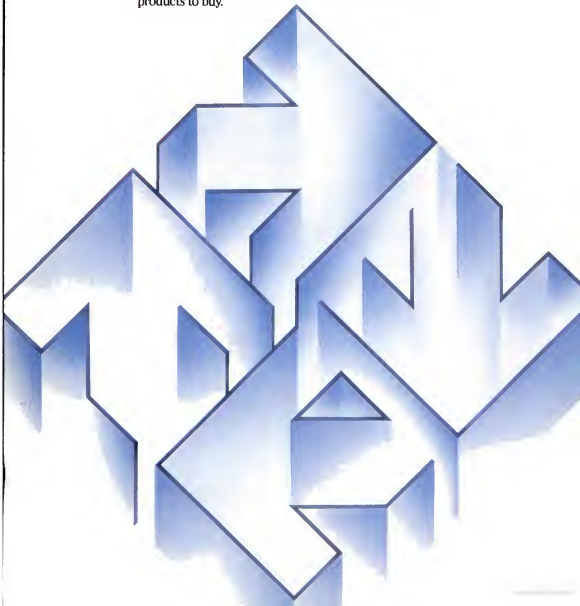




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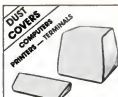
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# MARKETPLACE

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**Software Digitizers**  
begins on the following page

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### the ultimate target market!

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# MARKETPLACE

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Miscellaneous  
Mailing Lists  
begins on the following page

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# MARKETPLACE

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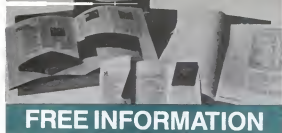
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LaserJet 100/120/150/200/250/300/350/400/450/500/550/600/650/700/750/800/850/900/950/1000/1100/1200/1300/1400/1500/1600/1700/1800/1900/2000/2100/2200/2300/2400/2500/2600/2700/2800/2900/3000/3100/3200/3300/3400/3500/3600/3700/3800/3900/4000/4100/4200/4300/4400/4500/4600/4700/4800/4900/5000/5100/5200/5300/5400/5500/5600/5700/5800/5900/6000/6100/6200/6300/6400/6500/6600/6700/6800/6900/7000/7100/7200/7300/7400/7500/7600/7700/7800/7900/8000/8100/8200/8300/8400/8500/8600/8700/8800/8900/9000/9100/9200/9300/9400/9500/9600/9700/9800/9900/10000/10100/10200/10300/10400/10500/10600/10700/10800/10900/11000/11100/11200/11300/11400/11500/11600/11700/11800/11900/12000/12100/12200/12300/12400/12500/12600/12700/12800/12900/13000/13100/13200/13300/13400/13500/13600/13700/13800/13900/14000/14100/14200/14300/14400/14500/14600/14700/14800/14900/15000/15100/15200/15300/15400/15500/15600/15700/15800/15900/16000/16100/16200/16300/16400/16500/16600/16700/16800/16900/17000/17100/17200/17300/17400/17500/17600/17700/17800/17900/18000/18100/18200/18300/18400/18500/18600/18700/18800/18900/19000/19100/19200/19300/19400/19500/19600/19700/19800/19900/20000/20100/20200/20300/20400/20500/20600/20700/20800/20900/21000/21100/21200/21300/21400/21500/21600/21700/21800/21900/22000/22100/22200/22300/22400/22500/22600/22700/22800/22900/23000/23100/23200/23300/23400/23500/23600/23700/23800/23900/24000/24100/24200/24300/24400/24500/24600/24700/24800/24900/25000/25100/25200/25300/25400/25500/25600/25700/25800/25900/26000/26100/26200/26300/26400/26500/26600/26700/26800/26900/27000/27100/27200/27300/27400/27500/27600/27700/27800/27900/28000/28100/28200/28300/28400/28500/28600/28700/28800/28900/29000/29100/29200/29300/29400/29500/29600/29700/29800/29900/30000/30100/30200/30300/30400/30500/30600/30700/30800/30900/31000/31100/31200/31300/31400/31500/31600/31700/31800/31900/32000/32100/32200/32300/32400/32500/32600/32700/32800/32900/33000/33100/33200/33300/33400/33500/33600/33700/33800/33900/34000/34100/34200/34300/34400/34500/34600/34700/34800/34900/35000/35100/35200/35300/35400/35500/35600/35700/35800/35900/36000/36100/36200/36300/36400/36500/36600/36700/36800/36900/37000/37100/37200/37300/37400/37500/37600/37700/37800/37900/38000/38100/38200/38300/38400/38500/38600/38700/38800/38900/39000/39100/39200/39300/39400/39500/39600/39700/39800/39900/40000/40100/40200/40300/40400/40500/40600/40700/40800/40900/41000/41100/41200/41300/41400/41500/41600/41700/41800/41900/42000/42100/42200/42300/42400/42500/42600/42700/42800/42900/43000/43100/43200/43300/43400/43500/43600/43700/43800/43900/44000/44100/44200/44300/44400/44500/44600/44700/44800/44900/45000/45100/45200/45300/45400/45500/45600/45700/45800/45900/46000/46100/46200/46300/46400/46500/46600/46700/46800/46900/47000/47100/47200/47300/47400/47500/47600/47700/47800/47900/48000/48100/48200/48300/48400/48500/48600/48700/48800/48900/49000/49100/49200/49300/49400/49500/49600/49700/49800/49900/50000/50100/50200/50300/50400/50500/50600/50700/50800/50900/51000/51100/51200/51300/51400/51500/51600/51700/51800/51900/52000/52100/52200/52300/52400/52500/52600/52700/52800/52900/53000/53100/53200/53300/53400/53500/53600/53700/53800/53900/54000/54100/54200/54300/54400/54500/54600/54700/54800/54900/55000/55100/55200/55300/55400/55500/55600/55700/55800/55900/56000/56100/56200/56300/56400/56500/56600/56700/56800/56900/57000/57100/57200/57300/57400/57500/57600/57700/57800/57900/58000/58100/58200/58300/58400/58500/58600/58700/58800/58900/59000/59100/59200/59300/59400/59500/59600/59700/59800/59900/60000/60100/60200/60300/60400/60500/60600/60700/60800/60900/61000/61100/61200/61300/61400/61500/61600/61700/61800/61900/62000/62100/62200/62300/62400/62500/62600/62700/62800/62900/63000/63100/63200/63300/63400/63500/63600/63700/63800/63900/64000/64100/64200/64300/64400/64500/64600/64700/64800/64900/65000/65100/65200/65300/65400/65500/65600/65700/65800/65900/66000/66100/66200/66300/66400/66500/66600/66700/66800/66900/67000/67100/67200/67300/67400/67500/67600/67700/67800/67900/68000/68100/68200/68300/68400/68500/68600/68700/68800/68900/69000/69100/69200/69300/69400/69500/69600/69700/69800/69900/70000/70100/70200/70300/70400/70500/70600/70700/70800/70900/71000/71100/71200/71300/71400/71500/71600/71700/71800/71900/72000/72100/72200/72300/72400/72500/72600/72700/72800/72900/73000/73100/73200/73300/73400/73500/73600/73700/73800/73900/74000/74100/74200/74300/74400/74500/74600/74700/74800/74900/75000/75100/75200/75300/75400/75500/75600/75700/75800/75900/76000/76100/76200/76300/76400/76500/76600/76700/76800/76900/77000/77100/77200/77300/77400/77500/77600/77700/77800/77900/78000/78100/78200/78300/78400/78500/78600/78700/78800/78900/79000/79100/79200/79300/79400/79500/79600/79700/79800/79900/80000/80100/80200/80300/80400/80500/80600/80700/80800/80900/81000/81100/81200/81300/81400/81500/81600/81700/81800/81900/82000/82100/82200/82300/82400/82500/82600/82700/82800/82900/83000/83100/83200/83300/83400/83500/83600/83700/83800/83900/84000/84100/84200/84300/84400/8450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## FREE INFORMATION

### About Products & Services

**In this Issue!** Here's your chance to have all the facts, figures, and specifications about the products or services advertised or mentioned in this issue of PC Magazine. Absolutely free of charge!

Just complete the attached card. We'll notify the manufacturers or distributors so you can receive your free brochures directly from them.

**It's as easy as 1, 2, 3**  
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dozens of products right at your  
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**1** Fill in your name and address and check off your answers to the three research questions. (One card per person, please.)

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- 1) For which of the following products are you involved in selecting brands/models to be bought by your company or organization? (check all that apply)

#### Hardware

- a. ☐ Mainframe  
b. ☐ Mini  
c. ☐ PC  
d. ☐ Printers/  
e. ☐ Plotters  
f. ☐ Monitors  
g. ☐ Terminals  
h. ☐ Modems

- h. ☐ Hard Disk/Tape Back-up  
i. ☐ Add-in Boards  
j. ☐ LANs  
k. ☐ Micro-Mainframe Links

#### Software

- l. ☐ Communications  
m. ☐ Accounting  
n. ☐ Spreadsheets/  
o. ☐ Financial Planners  
p. ☐ Project Managers  
q. ☐ Word Processors  
r. ☐ Database Managers  
s. ☐ Graphics

- 2) Your primary job function is (check)

- s. ☐ Administrative/General Management  
t. ☐ MIS/DTP Communications Systems, Programming  
u. ☐ Engineering/R&D  
v. ☐ Finance/Accounting  
w. ☐ Marketing/Sales

- 3) Next step after information is received:

- x. ☐ Purchase Order  
y. ☐ Evaluation  
z. ☐ Specification/Recommendation

PLEASE PRINT CLEARLY—use only one card per person

Name \_\_\_\_\_ Bus. Phone (\_\_\_\_) \_\_\_\_\_

Company \_\_\_\_\_ Title \_\_\_\_\_

Address \_\_\_\_\_ Apt. \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

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Are you frequently called upon to give advice about PC products? Is it your responsibility to make PC hardware, software and peripherals selections?

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## PC MAGAZINE ADVERTISING SALES STAFF

Advertising Coordinator . . . Vickie Pinsky  
Advertising, Systems Manager . . . Vicki Egan  
1 Park Avenue, New York, NY 10016 (212) 503-5100

### James Ryan - Eastern Advertising Director

(212) 503-5100  
MA, NH, VT, ME, RI, CT  
Jonathan Lane - District Manager  
The Presidential Center  
800 Brighton St., Ste 1390  
Boston, MA 02199  
(617) 375-4300  
John Backhouse - Account Representative  
(212) 503-5132  
DE, MD, DC, VA, WV, NC, AL, MS, TN, AR, KY, PA, CA  
Sonny Bressler - District Manager  
Charisse Smith - District Sales Representative  
5801 Peachtree Dunwoody Road - Suite 500  
Atlanta, GA 30328  
(404) 394-6500  
Lauren Morse - Account Representative  
(212) 503-5130

### NY, NJ, PA

Liz Medley - District Manager  
(212) 503-5307  
Pat Toohay - District Sales Representative  
One Park Avenue  
New York, NY 10016  
(212) 503-5140  
Mary Jo Nelson - Account Representative  
(212) 503-5126  
ME, NH, E, W, MN, MO  
Dale Miller, Jr., MD, SD, Canada  
Arthur Kosack - District Manager  
John Shefford - District Sales Representative  
180 N. Michigan Avenue Suite 1400  
Chicago, IL 60601  
(312) 346-2600  
Sean Seymour - Account Representative  
(212) 503-5126

### Jeff Miller - Western Advertising Director

(415) 598-2332  
CA (San Francisco & North), OR, WA, ID  
Hank Spencer - District Manager  
11 Davis Drive  
Alhambra, CA 94002  
(415) 598-2347  
Adele Horner - Account Representative  
(212) 503-5129  
CA (San Diego & San Jose), ID, MT, WY  
Geri Turnage - District Manager  
11 Davis Drive  
Alhambra, CA 94002  
(415) 598-2344  
Beth Tumes - Account Representative  
(212) 503-5127

### CA, IL, San Diego & Orange County, AZ, NV, HI

Debra Huxley - District Manager  
(212) 503-5100  
Steve Lincoln - District Sales Representative  
3460 Wilshire Blvd  
Los Angeles, CA 90010  
(212) 503-5100  
Ron Kost - Account Representative  
(212) 503-5100  
TX, IL, VA, KS, UT, NM, CO  
Jennifer Burt - District Manager  
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That quality of response comes from a very special audience: a circulation of 375,000 brand specifiers—the largest and fastest growing

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They look to PC Magazine because PC Magazine's product reviews, backed by the resources of our PC Labs, are the best in the industry, and are in fact the only test-based comparative reviews available.

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\*AdScope  
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## COMING UP

### SPECIAL REPORT: HARD DISKS

While dual-floppy PCs are sure to be with us for a while longer, hard disk drives are starting to be perceived as standard equipment, especially in the business sector. What better time to take a broad look at hard disk products and mass-storage optimization? Winn L. Rosch evaluates eight high-powered hard disk drives, all of which have storage capacities of over 100 megabytes, and Frank Bican and Walt Rowinsky examine disk drives available by mail order and through system packagers to find out where the best values are. Also included: a look at alternatives to conventional hard disks, and Paul Somerson's down-to-basics guide to optimal hard disk organization.

### SOFTWARE FOR MICROSOFT WINDOWS

Everyone talks about the multitude of applications that the *Microsoft Windows* operating environment will accommodate in the future, but what about the present? Here are eight programs available now from Palantir, Microsoft, Micrographix, and The Whitewater Group that take advantage of the *Windows* environment.

**CLUSTERED CPU SYSTEMS** Our connectivity series continues with a discussion of clustered CPU systems, diskless workstations that are smaller and cheaper than even the LANstation. Can these systems satisfy your networking needs? Reviews include systems from Alloy, NorthStar Computers, and Our Business Machines.

**NEW PLOTTERS** No sooner did we finish our last reviews of large-size D and E plotters when several upgrades and new models came on the market. Glenn Hart examines seven of the newest, including the HP Draftmaster.

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